THE INDEPENDENT GUIDE TO IBM PERSONAL COMPUTERS

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The New Era: IBM's Breakthrough PC AT

Volume 3 Number 22
$2.95

November 13, 1984

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- DOS 3.0
- Awesome New Chip

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dBASE III vs. dBASE II

IBM's State-of-The-Art Network

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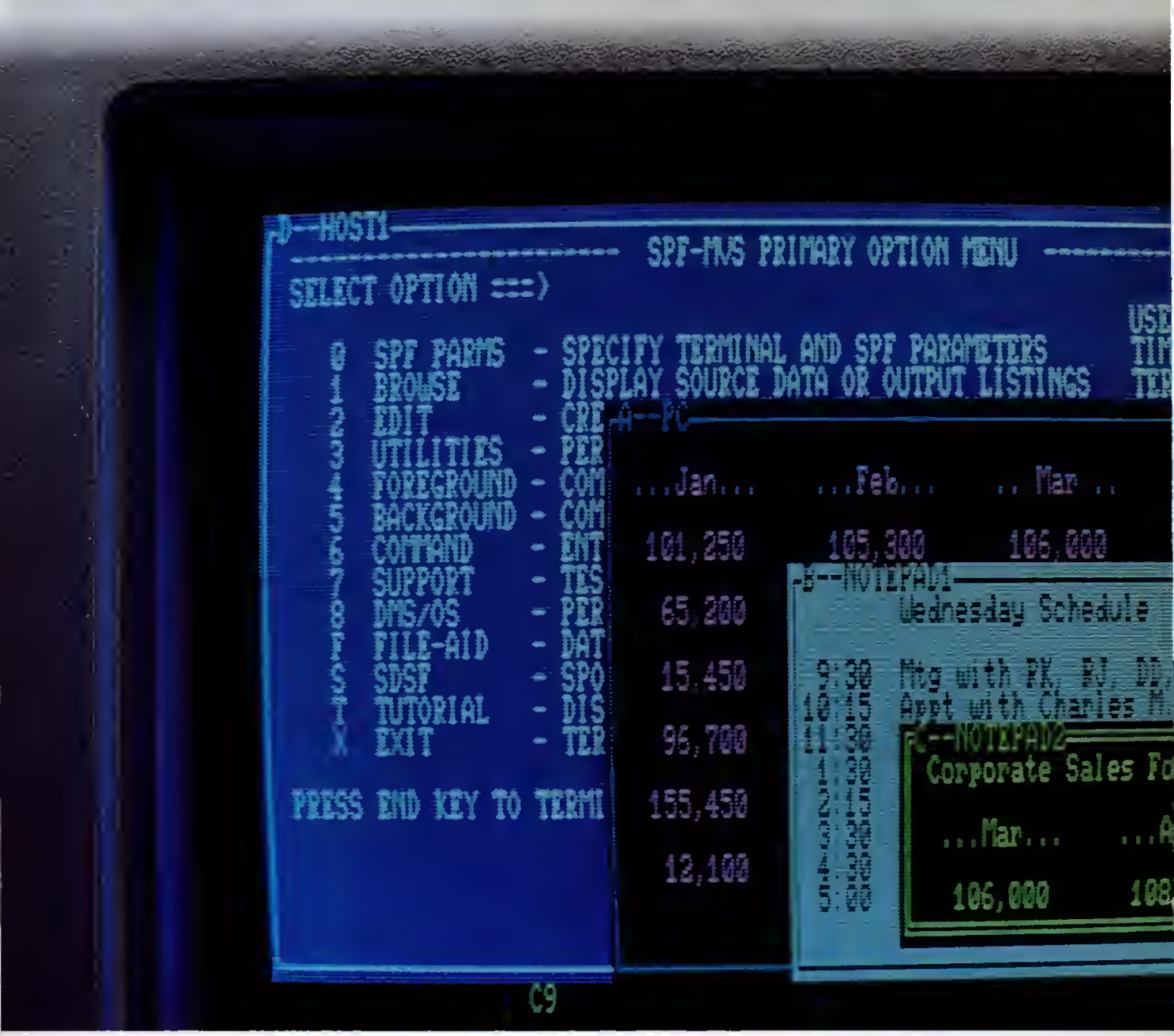

Compared to this, other 3278/79 emulators aren't much to look at.

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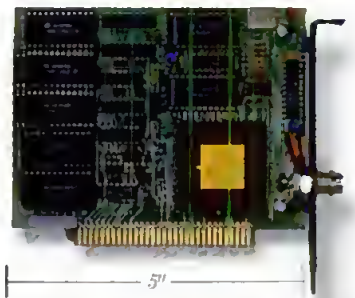

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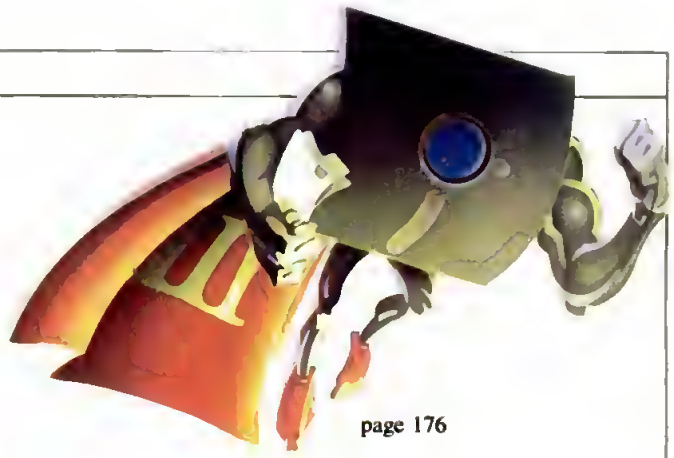

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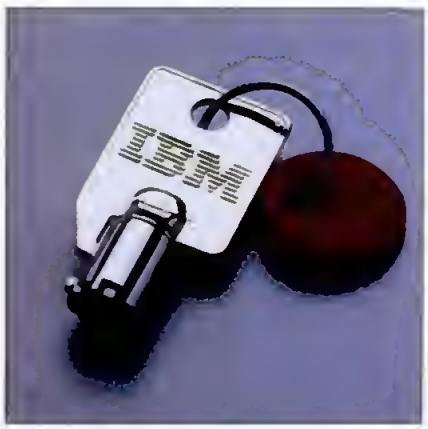

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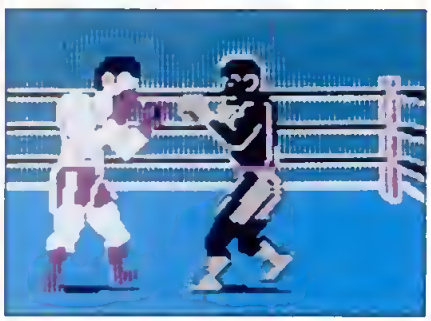

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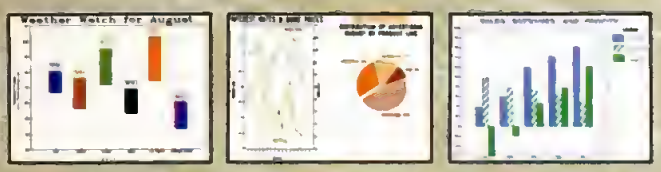

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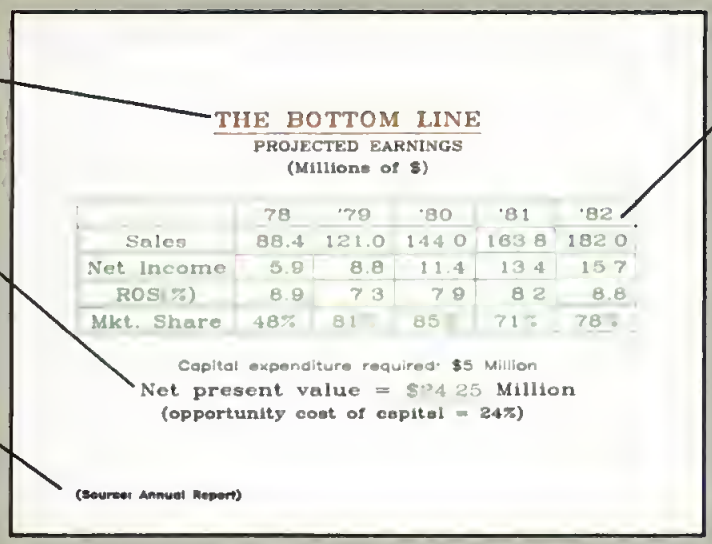

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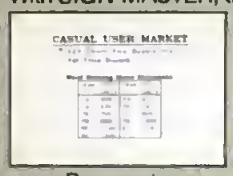

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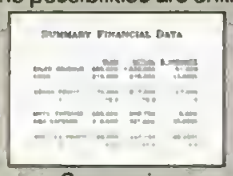

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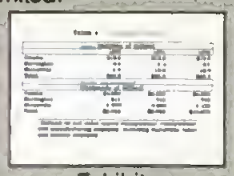
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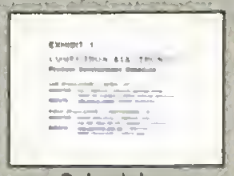
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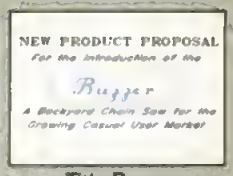

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What's Inside

PC's editors got to play with two wonderful new toys from IBM—the PC AT and the PC Network, both reviewed in this issue. These toys, and others, caused quite a stir around our offices.

For the most part, the *PC* editorial staff works in a very democratic fashion (within, of course, the usual office hierarchy). It is assumed, for example, that all new staff members are already afflicted with microcomputer mania when they get here or will catch the disease shortly after they arrive.

So, when something exciting finds its way into our hands, it doesn't disappear into the inner reaches of editor Bill Machrone's office, never to be seen again by human eyes. Bill isn't that kind of editor—and he knows that any attempt to abscond with a new plaything would result in instant mutiny, at the very least.

Toys for Us

Bill often is not the first person to get his hands on a new product. That honor is reserved for Paul Somerson, whose total absorption in any new piece of hardware or software is legendary—at least, among us.

Events ran true to form when IBM announced its new PC AT microcomputer. Rumors, of course, had been rife for weeks, and the staff looked somewhat nervously forward to the press announcement that would introduce IBM's latest entry into the microcomputer field.

We were excited enough when the fateful day came and IBM showed the press what a marvelous little machine it had come up with (for a marvelous little price). However, it became a real red letter day when our editors returned to the *PC* offices to find that IBM had obligingly sent an AT by Federal Express for review so the staff would not have to wait to have a chance to play with it.

Photograph: Shig Ikeda

AT Mania

The AT was duly set up in Paul's office, and after the first oohs and aahs and the first demonstrations, most of the staff retired to their offices to get back to work. Or so they thought.

Throughout the day, as Paul got to know his new toy, cries of "I don't believe it!" and "Expletive deleted!" were heard from his general direction. Well, no true computer enthusiast could ignore these noises, so, like a flock of birds following a mating call, the entire staff would pile around Somerson's desk to observe the latest trick. As you can well imagine, not a great deal of work got done that day.

Network Mania

Paul was not the only one to play with an impressive IBM toy, however. Bill Machrone also got his chance, with the new PC Network. Although the network won't be available until the first quarter of 1985, and we usually don't review anything until it is on the shelves, Bill was so excited by what he saw at the PC Network press introduction that he couldn't wait to write about it. Since Bill knows about as much about microcomputers as anyone would care to, when he is impressed by a product, you can be pretty sure that it's impressive.

"It had a half-dozen PCs and ATs," he said, bemused, "with a full cable television system, cameras, a remote laser disc player, all running on the same network at the same time!"

SF Mania

And as long as I'm on the subject of Bill Machrone, I may as well mention something else that caused him to get ex-

cited recently. I am not giving away any secrets when I say that Bill is a science fiction fan. Like many of our readers, he graduated from reading about fictional computers to playing with real ones.

Well, Bill was reading a new novel, called *Earthchild*, by Sharon Webb, and he happened to notice that one of the people mentioned in the acknowledgments was a gentleman named Jeff Duntemann. This name sounded vaguely familiar to Bill. He searched his memory until he realized that somebody named Jeff Duntemann had written a fine article on Turbo Pascal for this issue of *PC*.

He got on the phone to Jeff and asked if he and the writer mentioned in the book were the same. Jeff laughed and informed Machrone that he was indeed the same person and in fact had several science fiction books to his credit. And we thought Bill had been impressed by the PC Network!

Across the GOLDENGATE

In spite of all our talk about playing with toys, we think of ourselves as a pretty professional bunch. We were gratified to learn that Cullinet Software Inc. thought so too. Cullinet's new *GOLDENGATE* integrated software, which is reviewed in this issue, may well be the long-sought-after bridge between mainframes and micros, and as such, is an important addition to the computer marketplace.

> Cullinet wanted its new product reviewed by people who know the computer field, so they choose PC.

However, the people at Cullinet were a trifle nervous about the best way to enter the micro sweepstakes. Until now, the company had been predominantly a publisher of mainframe software, and it wanted to make sure that its new product would be reviewed by people who really know the computer field. So it isn't surprising that the magazine they chose to introduce *GOLDENGATE* was *PC*.

At least, it wasn't surprising to us. ■

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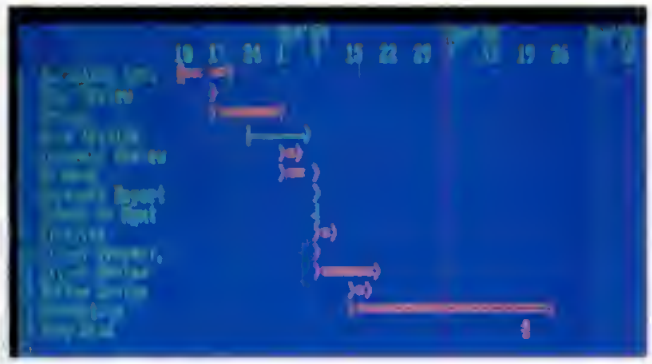

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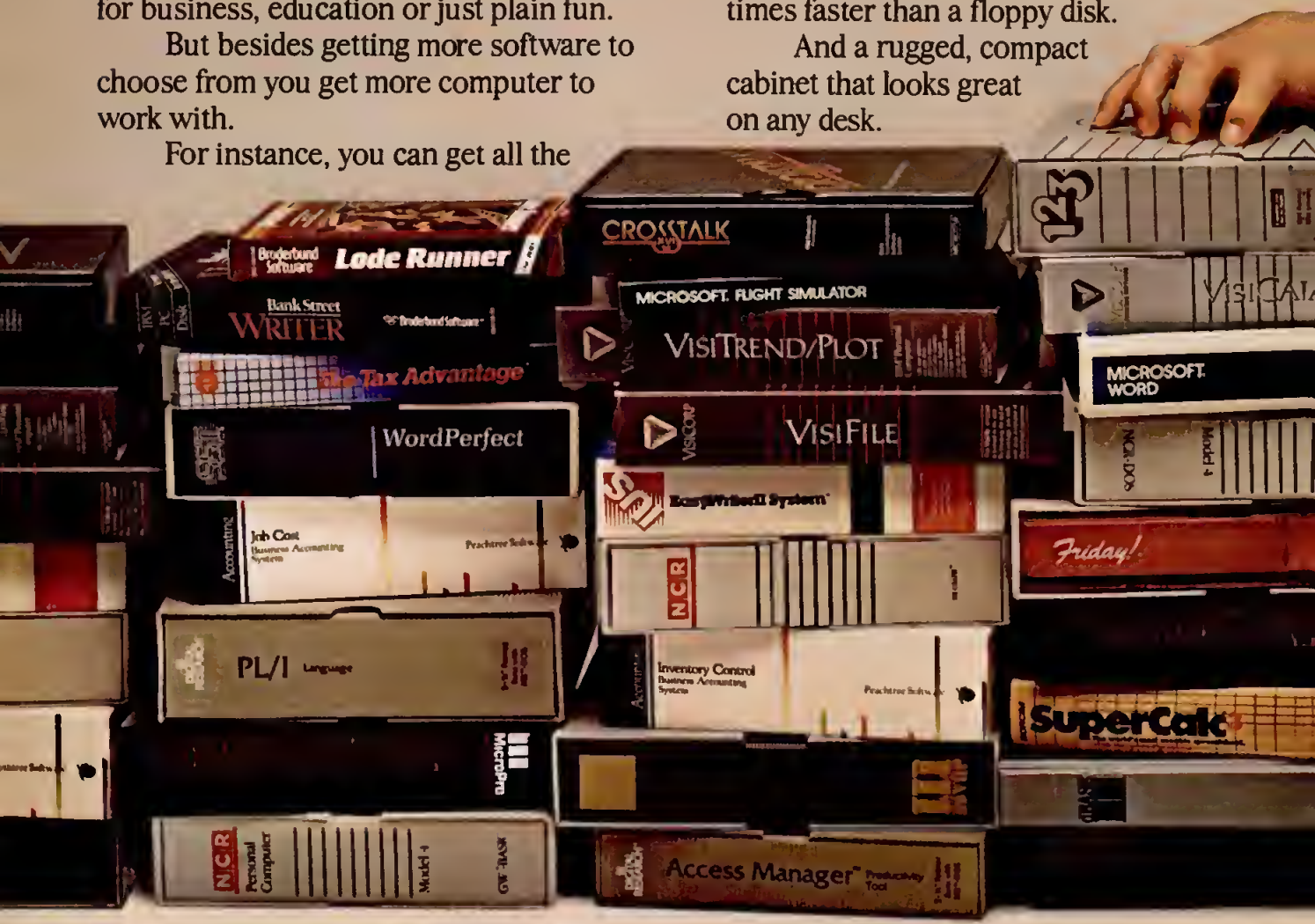

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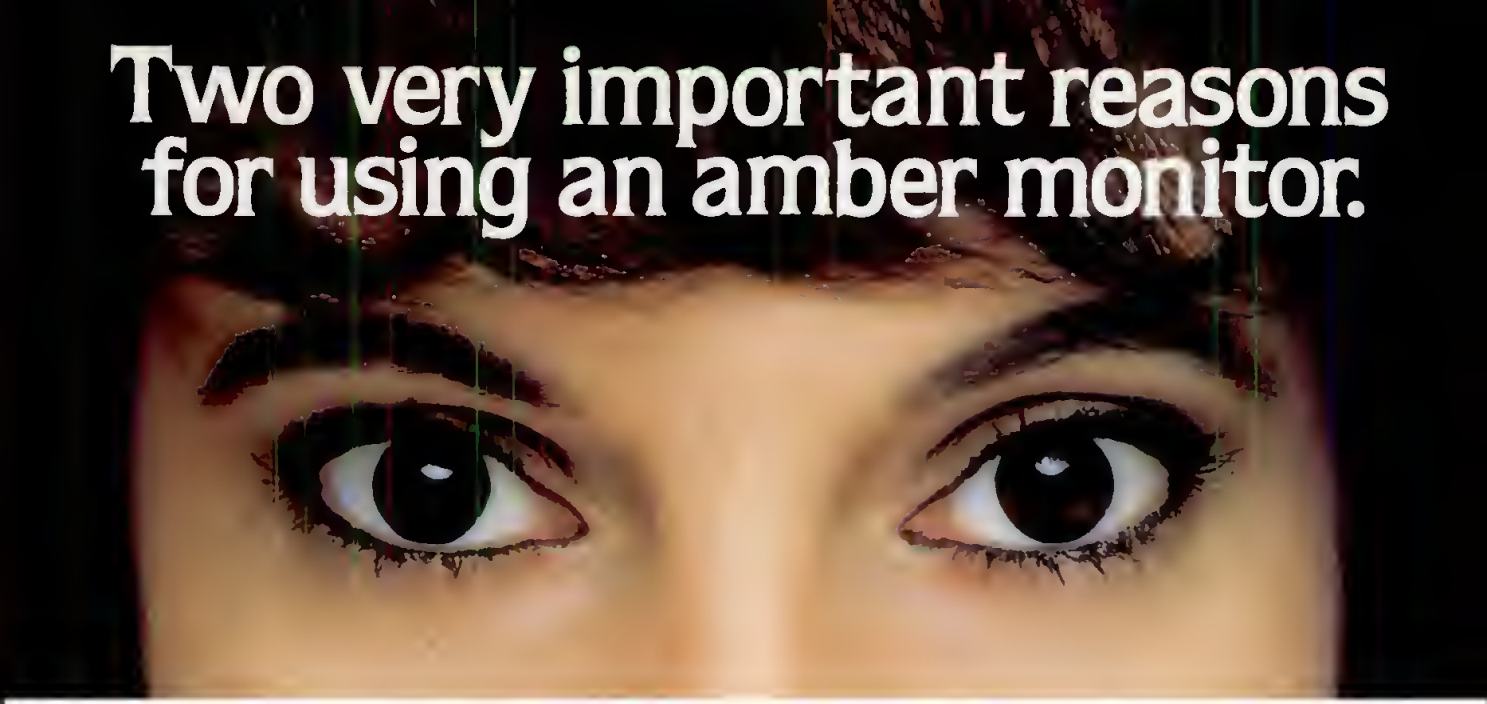

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IRMA™ has just made PC-to-mainframe communications a touch faster.

Until now, when you operated the PC in the terminal emulation mode, keys had to be redefined.

For inexperienced users, that could be both awkward and time-consuming.

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The result again was an increase in the chance for human error.

As well as an increase in the amount of time and money spent on a job.

Now IRMA's addressed both those problems with a keyboard that costs only $329, suggested retail.

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HX-12. A high resolution monitor at a medium resolution price.

HX-12 is a high resolution RGB color monitor that's colorful enough for all your graphics needs and sharp enough for word processing.

With its own cable that plugs directly into the IBM PC, the HX-12 delivers a rainbow of 16 colors on a non-glare screen. All that includes clean whites without red bleed. In fact, all the colors are clean and crisp thanks to the HX-12's .31 mm dot pitch and 690 × 240 (non-interlaced) resolution.

Shop around. Nothing else compares to the HX-12 priced et just **$695.**

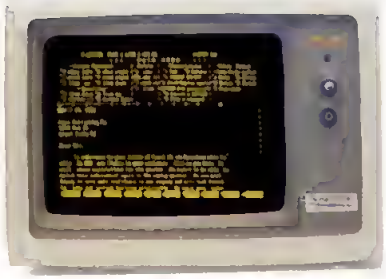
The SR-12 delivers even better resolution color for a better-than-ever price.

At first glance, the SR-12 might appear similar to the HX-12 with a non-glare screen and .31mm dot pitch supporting 690 horizontal resolution. But take a closer look. SR-12's scan frequency is 31.5 KHz, ellowing the SR-12 to support 480 vertical resolution in non-interlaced mode. Thet means a high-quality, flickerless image with text that's up to monochrome standards. What's more, you get all that quality for **$799.**

For full compatibility with all IBM software, get the **Princeton Scan Doubler.** Priced et **$249,** it allows you to run the SR-12 from a standard IBM or IBM equivalent color card in the IBM PC.

You can't beat the SR-12 for resolution or price.

MAX-12. You won't find a better monochrome monitor for a better price.



PGS combines easy-on-the-eyes amber phosphor and exceptional 800 × 350 resolution to give you the MAX-12, the best monochrome monitor for your money.

Check the non-glare screen. Dynamic focusing circuitry keeps the image sharp, not only in the center, but around the edges and in the corners. Then check the price. At **$249** the MAX-12 is less expensive than the leading green-on-black competitor. And there's more. The MAX-12 works with the IBM PC and other IBM competibles.

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IBM Personal Computer Trends and Developments

IH News

FROM THE EDITORS OF PC

NOVEMBER 13, 1984

IBM's New PC Fall Line: Great Graphics, Colors

Two new color and graphics systems brighten the PC—but challenge compatibility

BY CRAIG L. STARK

NEW YORK—After treating the PC's limited color graphics capabilities with benign neglect for 3 years, IBM has quickly followed its recent introduction of the PC AT with an announcement of not one, but two, new graphics systems for the entire PC series, excepting the PC*jr*.

Because of scanning-rate differences with the new IBM systems, however, many existing third party vendors' monitors and graphics boards will have to be redesigned or will have to face direct competition from Big Blue.

The first of the two new PC graphics systems includes an RGB TTL Enhanced Color Display monitor with 650-by-350 pixel resolution, a choice of 16 simultaneous colors from a 64-color palette, and reduced (0.31 mm) dot-pitch size. The new monitor uses horizontal scan frequencies of 22 kHz and 15.75 kHz (switched by the polarity of the vertical sync pulse) to provide both the new high-resolution modes and compatibility with the previous 640/320-by-200 color modes. The unit accepts 50 to 60 Hz vertical frame rates for noninterlaced operation. Scheduled for January 1985 delivery. the color monitor is priced at $849.

An Enhanced Graphics Adapter board ($524) that supports either the current PC monochrome or color monitor, as well as the new Enhanced Color Display, was scheduled for October delivery. In addition to 16-color operation when used with the new Enhanced Graphics Display, the new board provides 16-color graphics in both the medium-res (320-by-200) and high-res (640-by-200) graphics modes of the original IBM color monitor. Additionally, it supplies a 640-by-350 graphics mode for the current PC monochrome

(continued)

Jr's Growth Spurts Sales

BY WINN L. ROSCH

CLEVELAND—The Save-the-Junior campaign, as some industry insiders termed IBM's recent enhancements for its smallest computer, is succeeding, at least according to most industry indications.

Before IBM released the PC*jr*'s new keyboard and memory module, entrepreneurs who had bet on a Junior-sized replay of the PC's success story were, at best, disappointed. Hardly 2 months ago, Marty Alpert, president of IBM aftermarket supplier Tecmar, half-seriously joked that he might have to add new warehouse space to the Tecmar factory.

Exactly mirroring PC*jr* sales at the time, Tecmar's enhancements were moving onto warehouse shelves. According to Alpert, dealers were selling more of his PC*jr* accessories than the computers, and Tecmar was selling almost no PC*jr* peripherals. The inventory buildup was most easily measured in millions.

Two weeks after the new PC*jr* keyboard had hit the stores in

(continued)

Better Colors *(continued)*

monitor (8-by-16 pixel box for alphanumerics) and a 9-by-16 pixel box for complete compatibility with the present monochrome character set. The new color board permits user-generated characters that occupy up to a 8-by-32 pixel character box.

Additional memory is required for 16-color, 640-by-350 graphics. The Enhanced Graphics Adapter itself provides 64K. You can raise this to the needed 128K by adding IBM's new $199 Graphics Memory Expansion Card. Such expansion also permits an increase in the size of a user's program-loaded RAM-based character generator from 256 to 512 characters.

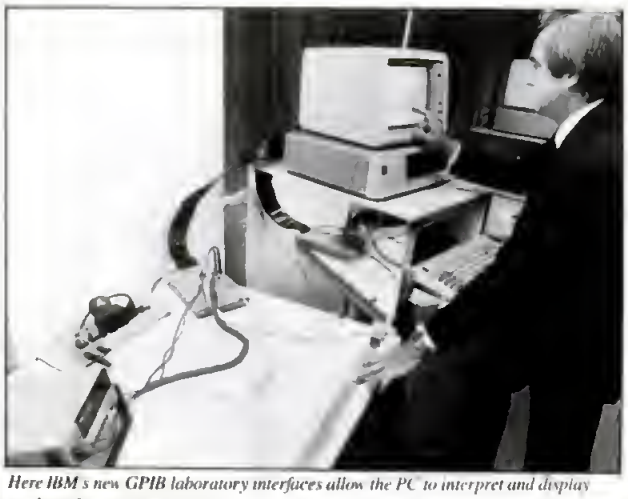
Still further memory expansion is available with the new 256K Memory Expansion Option ($489)—a board that is sized to fit in a short expansion slot in the PC, PC-XT, or Portable PC. The additional memory increases the permissible user character set to 1,024 and provides space for smooth scrolling, panning, and storage of additional graphics pages. The starting address for the 256K Memory Expansion Option is switch-selectable.

Professional Graphics

Even more sophisticated graphics facilities are provided by IBM's other new system, which is scheduled for delivery in October. This includes an analog RGB Professional Graphics Display monitor; a two-slot controller; ISO/proposed ANSI Graphical Kernel System (GKS) and other high-performance graphics software; and additional hardware/software packages designed principally for engineering and scientific applications.

Priced at $1,295, the new Professional Graphics monitor will permit the simultaneous display of up to 256 colors, drawn from a 4,096-color palette. Using a high-resolution, 640-by-480 pixel memory map, the new 14-inch monitor offers 67-pel-per-inch horizontal and vertical definition with a 0.31 mm dot size. The horizontal scanning frequency is 30.48 kHz, and the vertical frame rate is 60 Hz for noninterlaced operation. The video pel rate is 25 MHz.

The required interface for the new monitor is IBM's new $2,995 Professional Graphics Controller, which fits into two adjacent full-sized slots in a PC, PC-XT, or PC AT. (A PC Expansion Unit may also be used, though in this case a second monitor is required for diagnostic tests.)



Here IBM's new GPIB laboratory interfaces allow the PC to interpret and display readings from a strain gauge.

The new color controller provides an emulation mode compatible with current PC graphics as well as its own high-performance capabilities. It contains its own 8MHz 8088 processor, 64K of graphics firmware, and 320K of display storage. Built-in functions include two-and-three-dimensional rotation, translation, and scaling; vector and polygon drawing and polygon filling; use of either absolute or relative coordinates; user-definable colors; and hardware drawing in two or three dimensions.

Users may reprogram the built-in character set and may also vary character size. The system supports image transmission to and reception from all models of the PC series (except the PC*jr*), though very early models of the PC may require an updated ROM BIOS.

GSS Tools

To assist in the development of sophisticated graphics application packages using PC-series microcomputers, IBM has adopted a number of software packages produced by Graphic Software Systems (GSS), of Wilsonville, Oregon. The IBM Graphical Kernel System (or GSS-Toolkit Kernel System) provides a library of two-dimensional graphics primitives (subroutines) designed to implement the ISO and proposed ANSI GKS standard. The graphic routines included are device-independent and support segment rotation, scaling, and transformation. Language bindings are provided to FORTRAN 2.0, Professional FORTRAN, Lattice C, and BASIC compilers.

Graphics for Science

At the heart of the new software offerings is the Graphics Development Toolkit ($350). This includes the GSS Virtual Device Interface (GSS-Drivers) that permits software design to proceed independent of considerations of input and output device characteristics. Specific drivers for a wide range of printers, plotters, terminals, and input devices are already included. The Toolkit also provides subroutines for circles, arcs, pie slices, bars, multiple lines, and markers. Among the other Toolkit facilities are inking, rubberbanding, and a provision for preserving the aspect ratio when using non-1:1 devices. Language support is provided for IBM's FORTRAN 2.0, BASIC, and Pascal 2.0 compilers, and the Macro Assembler. Lattice C support will be the first in a series of customer updates available in a period of 12 months after receipt of the user's registration card.

In moves calculated to increase the usefulness of the PC series in science and engineering, IBM has also announced the availability of new laboratory-oriented interfaces. A $1,275 Data Acquisition and Control Adapter will provide four-channel analog input and two-channel analog output capability with 12-bit resolution, together with 16-channel digital I/O. Programmable timer/counter facilities and diagnostic tests are also provided. Up to four such units, each occupying one full-length slot, may be linked together by the user.

A full *Programming Support* package ($160) for the Data Acquisition and Control Adapter is also available. It contains appropriate high-level language subroutines and sample application programs in BASICA, Compiled BASIC, FORTRAN 2.0, Professional FORTRAN, and Lattice C (Version 2.0). Simplifying the actual equipment connection is a $245 shielded (FCC Class B) Distribution Panel with 88 barrier-type screw terminals and a flat cable with 60-pin connector.

To facilitate connection to other standard laboratory instruments, IBM now offers a General Purpose Interface Bus (GPIB) Adapter for ANSI/IEEE-488 (488A) equipment for $395. Together with its $85 *Programming Support* software, the GPIB allows control and monitoring of up to 14 IEEE devices, with user-selectable direct memory access and interrupt level. The adapter board can fit in a half-length slot; up to four boards may be controlled by the same programming support software.

Finally, of interest to the scientific community is the new IBM Professional FORTRAN, developed by Ryan-McFarland. A full-function ANSI 77 FORTRAN compiler and library that runs under DOS 2.1 or a later version, the new language package provides an interactive symbolic debut facility, supports the 8087 or 80827 math coprocessor, and permits program size in excess of 64K. ■

AT Fazes Symphony and Framework

But Symphony can be run using a "trick"

BY VIRGINIA DUDEK

NEW YORK—The battle for supremacy between the new "super" integrated software packages has been given a new wrinkle with the introduction of the IBM PC-AT. Lotus's *Symphony* and Ashton-Tate's *Framework* have been vying with one another since their respective announcements, but for the short term, a slight edge has to be given to *Symphony* since, in the short run, the AT knocks *Framework* completely out of the ring. *Symphony* manages to hang in there, albeit with some minor adjustments.

At press time, *Framework* does not work on the AT. Officials at Ashton-Tate would not reveal a patch or other method to retrofit the program for IBM's new computer.

However, all new copies of *Framework* will have new code compatible with the AT, as well as the PC, XT, and PC*jr*.

Apparently, two or three lines of the *Framework*'s present code are incompatible with the AT. The modifications being made to *Framework* will solve that problem and enable the program to boot directly off the hard disk. Registered users of *Framework* will be able to exchange their old copies for the new version, probably at the beginning of November, according to company officials.

Symphony Fix

Symphony gains the AT-advantage over *Framework*, but only slightly at the present time. During tests at *PC Magazine*, we found that the AT will not read the program correctly when it is booted in the A: drive or copied onto the hard disk.

However, we found an easy way to get the program running on the AT. To run it off the hard disk, you boot the machine and log onto the hard disk (C:). Then you log onto the appropriate subdirectory, and from there, you access the *Symphony* master disk in drive A:. Probably the easiest way to do this is to call for the directory (DIR A:).

When you call for the directory (or run CHKDSK or a similar DOS command), the AT will note that the disk in drive A: is a 360KB floppy, rather than a high-density disk. After that flag is properly set, the AT will run *Symphony* when you type A:SYMPHONY at the C> prompt.

It may be a little cumbersome, but all of the commands could be written into a batch file to save time. And, until the new copies of *Framework* are available, it is an easy way of using at least one of the powerful integrated packages on IBM's most powerful personal computer. ■

Jr's Sales *(continued)*

force, the whole picture changed. "One order wiped out our entire inventory of PC*jr* enhancements," said Johann George, Tecmar chief technical officer. "Now we're back into production of PC*jr* peripherals." (Although George kept the origin of the massive order a mystery, Sears Business Centers began almost simultaneously to promote the newly improved PC*jr*, favorably priced with the Tecmar add-ons.)

Changing Times

Even a casual passerby could not mistake that something had changed at the Solon, Ohio, Tecmar factory. Six months ago, when PC*jr* peripherals were being readied for production, both the factory and its parking lot were half full. Today, the parking lot overflows onto the adjacent grass, and workmen are adding additional space to the plant.

The PC*jr*'s improving sales haven't been the sole influence on Tecmar's growth but the corporate attitude is now very positive toward the PC*jr*.

Other manufacturers, even those without a current stake in the PC*jr* marketplace, have seen enough change in PC*jr* sales to reconsider their positions. Keith Cook, hardware production manager for Quadram Corporation of Norcross, Georgia, said, "We're developing several new products for the PC*jr*, and we wouldn't do that if we didn't believe that IBM's enhancements had turned it around."

Although Cook refused to specify exactly what new products were in the works, he hinted Quadram was preparing its future PC*jr* peripherals for the Christmas market.

Retail Surge

Retailers as well as manufacturers have taken note of an upsurge of interest–and sales–in the PC*jr*. The majority of retailers contacted said they had already sold more PC*jr*s in the few weeks after the new enhancements became readily available than they did in the whole 7 months of the product's previous incarnation.

Said Walt Klag, assistant manager at a Computer Depot store, "Before we got the enhancement, I sold a total of two PC*jr*s. In the 2 weeks that we've had the enhancements, I've already sold three, and I expect to sell three more tonight to a group of three small businessmen. I tried to sell them PCs, but they were certain they wanted PC*jr*s!"

Although the PC*jr* sales boom is too recent for real numbers measuring it to become available, industry analysts are already recharting their PC*jr* predictions. According to Barbara Isgur, microcomputer industry watcher and vice-president of Paine Webber, IBM probably sold no more than 50,000 PC*jr*s in the 7 months preceding the new keyboard. Her current estimate for 1984 sales is about 150,000. Although an improvement, that rate remains little more than half the estimate of 500,000 units for 1984 made by Future Computing at the end of 1983.

Future Computing itself, has revised its estimates downward. Tricia Parks, vice-president of the Texas firm's Home Computer Group, recently estimated that 200,000 PC*jr*'s would be sold by year-end.

Major Promotions

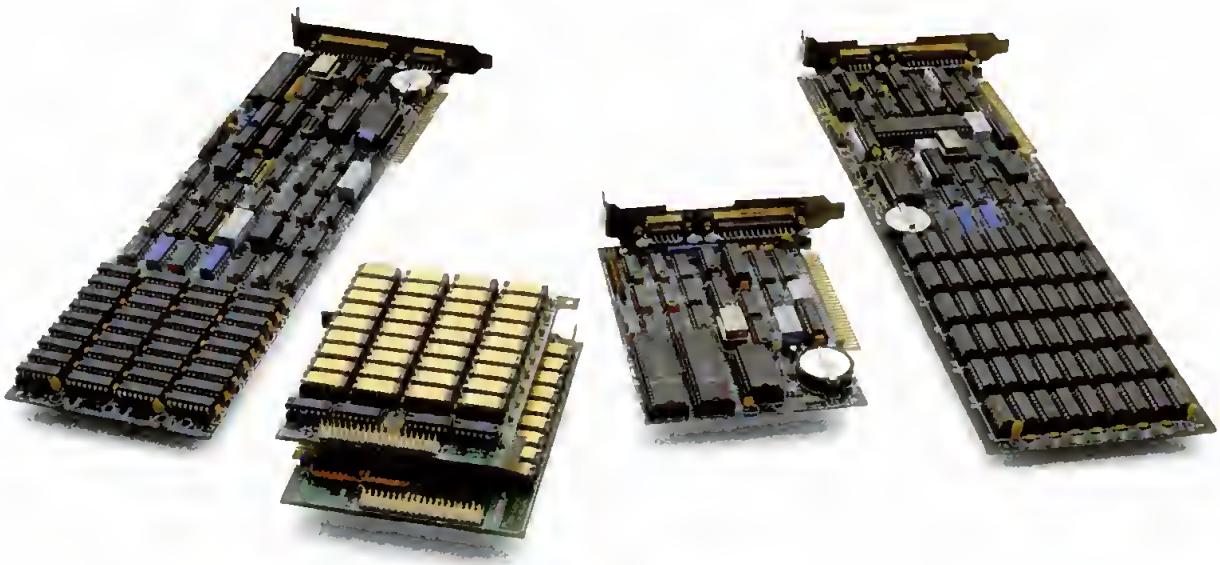
Until the end of October, retail sales representatives will receive a $25 bonus for each PC*jr* they sell. This will be quite a bit easier to accomplish because of several simultaneous promotions IBM is sponsoring.

In its "Back to School" promotion, IBM is giving away DOS 2.1, a BASIC cartridge, and *SAT* or the *Writing Assistant* software when a customer buys a PC*jr* and a color monitor. A similar business promotion will bundle DOS, BASIC, and either the IBM *Writing*, *Filing*, or *Reporting Assistant* software. Another promotion bundles DOS and either *Multiplan* or *PFS: File* and *Report*. All of these promotions are being supported with direct-mail campaigns to over 10 million people and will last until October 31.

Probably the most eye-catching promotion will take place from October 15 through January 31, 1985. The "Computerrific Sweepstakes" will be conducted with Proctor & Gamble. Consumers will be enticed to enter a sweepstakes with PC*jr*s as the prizes.

Will the Save-the-Junior program work? Will the minor irritation turn into a major money maker for IBM? According to Isgur, the PC*jr* will eventually earn its keep, but its story will be a disappointing sequel to the success of the PC. Although IBM will recoup its investment in the PC*jr* and save its corporate face, she says, the company's littlest computer won't find its way into every living room as IBM seemed to have initially imagined. At best, the PC*jr* will be an accepted partner in small businesses and, depending on the success of IBM's Writing-to-Read program, may play a greater role in education. ■

We have the missing pieces for your IBM PC.



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Performance and price. Until now, when you went shopping for multifunction boards, you had to settle for one or the other. IDEA gives you the best combination of both.

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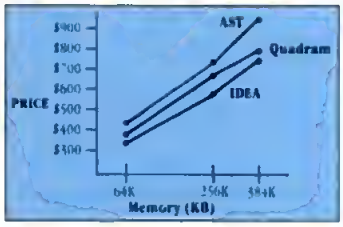
New Lower Price: $325.

But, more importantly, why pay $50 to $200 more for our competitors' boards when the IDEAmax is only $325 at the same fine stores? And that price buys you 64K, parallel port, serial port and clock/calendar options. Plus, a game port and a total of 384K memory are also available with IDEAmax.

And, best of all, every IDEAmax 384 is backed by the best quality and support in the business. As your needs expand, the unique IDEA upgrade policy gives you credit for your initial purchase when you're ready to trade up. No one else in the business makes you that offer.



(Based on published manufacturers' retail prices)

All new software that's free

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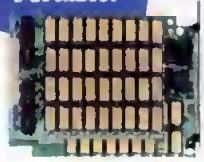
IDEAplus

This is our unique host adapter board for the IDEAdisk Plus. We've improved our reliable IDEAplus so that you can boot directly from the hard disk and add 256K, serial, and clock options without using an additional slot.

And now for the IBM Portable!



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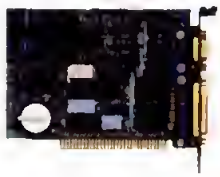

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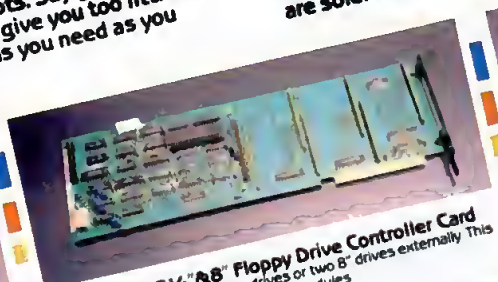

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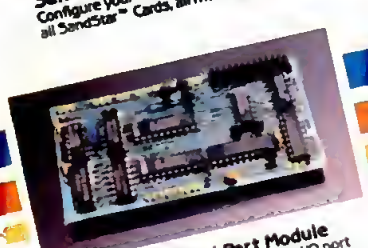

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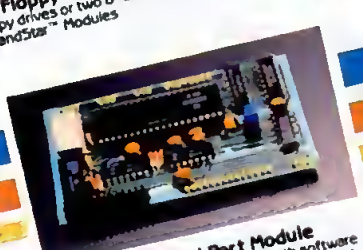

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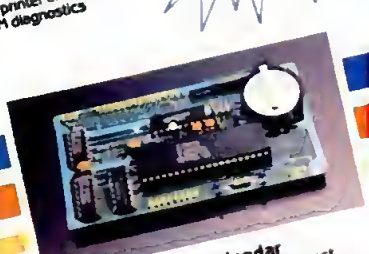

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PRODUCT REVIEW

IBM Utilities Give DOS a Personal Touch

BY TOM BADGETT

The utility programs reviewed here are part of IBM's initial release of 36 packages of Personally Developed Software—programs created by IBM employees and their families (see "IBM Floods Market with Low-Cost Software," *PC*, Volume 3 Number 21, page 33). IBM sells this software in no-frills packages without printed manuals; all documentation is provided in files on the program disks.

All five packages are available in a set, called the *Utilities Package*, for $56.95, which is far less than the combined price of $94.75.

Personally Developed Software is available through some IBM Product Centers and from authorized IBM dealers. These programs and a free catalog describing all 36 packages can be ordered by writing to IBM, Personally Developed Software, P.O. Box 3280, Wallingford, CT 06494. For phone orders, call (800) 426-7279.

Utilities I
by Gary Forghetti and Jack Gersbach
List Price: $19.95
Requires: DOS 1.1 or later

This package contains three useful utilities: a FILE COMPRESS and EXPAND DUO, plus a *DOS Command Retriever*.

The COMPRESS utility changes specified disk files so they take up less storage space; EXPAND puts these files back together again. You can reduce file size up to 43 percent with this utility, depending on the file type. Of course, you can't use your files while they are compressed, so the EXPAND utility is necessary to restore the original file format. It takes about a minute to compress a 64K file and a little less than that to expand it.

You would probably use these programs only to store large data or text files for backup or archive purposes. This use, however, could reduce the number of floppies or hard-disk space you need for your files.

The RETRIEVE program is generally more useful. It lets you make up short abbreviations for DOS commands, store these commands in an "alias" file, and use your custom command names with DOS instead of the originals. The program also remembers keyboard or program-generated DOS commands (up to 512 characters) and lets you access them with the cursor control keys. Finally, RETRIEVE redefines some keys to allow DOS command editing, which is much easier to learn and more versatile than the function key commands built into DOS.

For heavy users of DOS, RETRIEVE alone makes the cost of IBM's *Utilities I* disk worthwhile. If you need file compacting as well, so much the better.

Utilities II
by James Feeney, David Bishop, and Robert A. Flavin
List Price: $19.95
Requires: 128K DOS 2.x

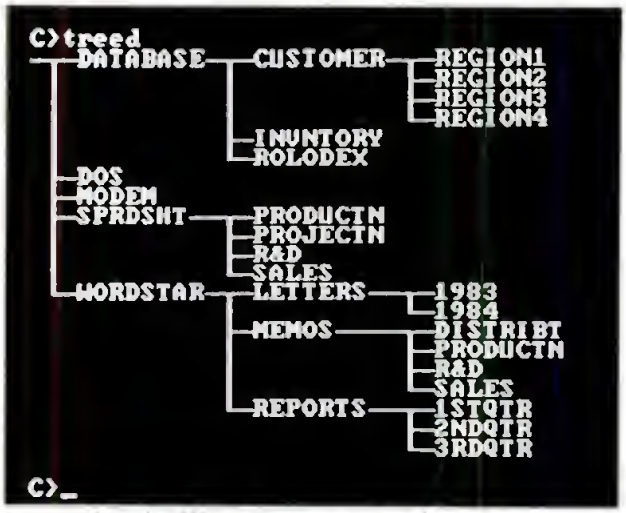
The IBM *Utilities II* disk contains four DOS-level utilities: BACKUP, UNMARK, *File Locator*, and *DOS Tree Display*. While hard-disk users may benefit most from them, all of these programs work with single or dual floppy systems.

DOS 3.0 includes a BACKUP utility that will work with floppies, but it stores the backed-up files in a special format, so you can't use their data until you run RESTORE. The BACKUP program on the *Utilities II* disk is less elaborate: It copies modified files to the specified disk or subdirectory. The resulting copies are in standard DOS format and can be used like any other files.

The UNMARK utility, a companion to BACKUP, lets you manually set a disk's archive bits; a unique memory location for each file tells backup routines if any file has been changed since the last copy was made. With UNMARK, you can turn all archive bits on or off. Unfortunately, you can't specify individual files for change. Even so, UNMARK gives you some degree of control over which files are backed up at the end of a session. This utility works with the DOS 3.0 BACKUP or the version provided in *Utilities II*.

File Locator helps you find a file that is somewhere in one of your subdirectories. Run the LOCATE routine and tell it which file you're looking for; you'll get a display showing file size, date, time, and location. You can look for a range of files by using wild-card symbols (* and ?). LOCATE also helps find a filename appearing in multiple directories.

For subdirectory users, the *Tree Display* program is a must. Unlike the DOS TREE command that prints a list of directory paths and the subdirectories in each path, *Tree Display* shows graphically all relationships among disk directories. The result is similar to an organization chart, with vertical and horizontal lines connecting the different directories. You can tell at a glance what directories are where and how they relate to elements higher in the tree. Unfortunately, the chart only appears on the computer screen. It can be printed only by using a graphics screen dump utility.



DOS Tree Display, in Utilities II, diagrams a hard disk's directory structure.

DOS File Tracker
by Barry N. Shiffrin
List Price: $19.95
Requires: 128K DOS 1.1 or later, two disk drives

Ever notice how your computer's disks seem to multiply faster than coat hangers in a closet. If you count your disks every few months, you'll find a geometric progression that expands faster than your storage space. Soon it's impossible to remember which disk holds what, and you'll probably muse that a 2-kilobuck hard disk isn't too expensive after all.

IBM's *DOS File Tracker* program may stave off that major

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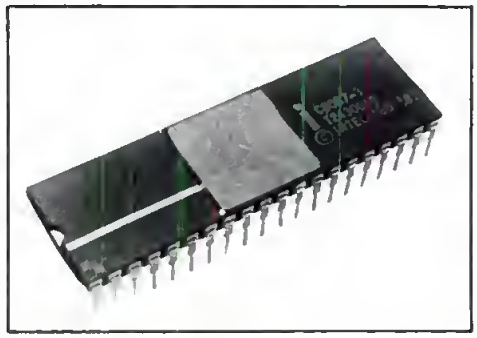

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CIRCLE 331 ON READER SERVICE CARD

IBM Utilities *(continued)*

purchase just a little longer. This program reads directories from multiple disks and stores this information in a separate data file. You can add comments to each filename and sort the names by disk ID, date, or filename extension. With it, you can keep a current catalog, which helps you to find the files you need and to reduce file duplication.

The *DOS File Tracker* is well-documented and uses menus, on-screen prompts, and single-key entry for ease of operation. Each directory is read into memory as you use it, so the more memory you have available, the larger each directory can be.

On a 128K RAM machine you can have about 386 directory entries. You may want to divide the list up by type, such as word-processing files in one directory and entertainment programs in another.

While you may find the initial setup somewhat cumbersome, once you've created the master directories, it will be relatively easy to maintain them whenever you change the information on any disks.

File Facility
by Ronald L. Saunders and Michael R. Turner
List Price: $19.95
Requires: 128K DOS 2.x

For years, third-party vendors have designed add-on hardware and software to fix a flaw or enhance a feature in original computer products. Now, IBM is doing this for its own software. The recently-released *File Facility* is a DOS overlay that does away with a troublesome PATH file-handling restriction found in DOS 2.0 and later versions.

The PATH facility lets you tell DOS where to look for the files you want. With PATH, you can be in a heavily nested subdirectory on the hard disk and call for a file in a drive A: subdirectory, without specifying the drive and path in the file name.

The problem, however, is that PATH only recognizes files that can be executed from DOS: those with .COM, .EXE, and .BAT extensions. Therefore, an applications program—word processor, spreadsheet, mail list, or accounting package—must be in the same directory as its data or overlay files. For example, if you're using one word-processing subdirectory for personal correspondence, another for business, and a third for a mailing list, you'll need three copies of the word-processing software and its support files.

The new *File Facility* helps PATH find any type of file. With this utility, you can use subdirectories that store different kinds of data, but you will need only one copy of the application program.

File Facility also helps adjust older programs to the newer computers and operating systems. Some programs that were written before DOS 2.0 don't support hard disks and subdirectories very well. Some even lock you into a specific drive configuration by preceding each program name with a drive specification. *File Facility* will first try to find the file on the specified drive; if it isn't there—say, because you've moved all your software from a dual floppy system to a hard disk—the utility will search all drives and directories until the file is found.

Like other programs in IBM's Personally Developed Software series, *File Facility* offers only on-disk documentation, but this is quite detailed. It includes examples and applications notes to help you get the most out of this utility and the built-in DOS commands.

The sorting options are presented in this menu

The StarProof Bridge
by Arnold Schaeffer
List Price: $14.95
Requires: 128K RAM, DOS 2.x, *WordStar, Word Proof*

The Starproof Bridge is intended for a very specific audience: *WordStar* users who want to run texts through IBM's *Word Proof* spelling checker. The *Bridge* provides an interface between *WordStar* files and *Word Proof*.

The program includes a routine (CONV) that converts *WordStar*'s idiosyncratic files into straight ASCII format. ASCII conversion is done automatically as part of the *Word Proof* interface, but afterward, the file is put back into its original *WordStar* format when the checking is done. If you need a *WordStar* file in an ASCII format, CONV does the job and retains any special printer control characters that were part of the original file. This causes the file to appear curiously on the screen—control characters are displayed as smiling faces and other special characters—and your printer may be upset when you list the file.

One important warning: When using CONV, if a disk error occurs, such as a disk-full condition, the program will appear to end normally, but actually the converted file is truncated or nonexistent. You should always check the results of the CONV process; never assume it was properly conducted. There are no error messages or progress reports built into *The StarProof Bridge*.

Although this utility is menu driven, you must remember on your own to save the file after it's checked with *Word Proof*. The utility moves the file into memory to work on it, so no changes are saved to disk until you ask to do that through the menu.

WordStar users who have longed to make use of IBM's extensive spelling dictionary will find *The StarProof Bridge* a useful addition to their program libraries. ■

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Select's *4-1-1* is available for the IBM PC-XT and other IBM compatibles with hard disks and 256K RAM. It works with files created by *WordStar* and all Select writing systems, including *Select Bilingual*, *Select Write*, the new *Freestyle* writing system, and all software that generates ASCII-like files. Retail price is $149.

Select's second addition is *Freestyle*, an outline-based writing system designed to help prepare lengthy documents. *Freestyle* also has a Draw feature that creates line drawings, arrows, and shading by moving the cursor keys.

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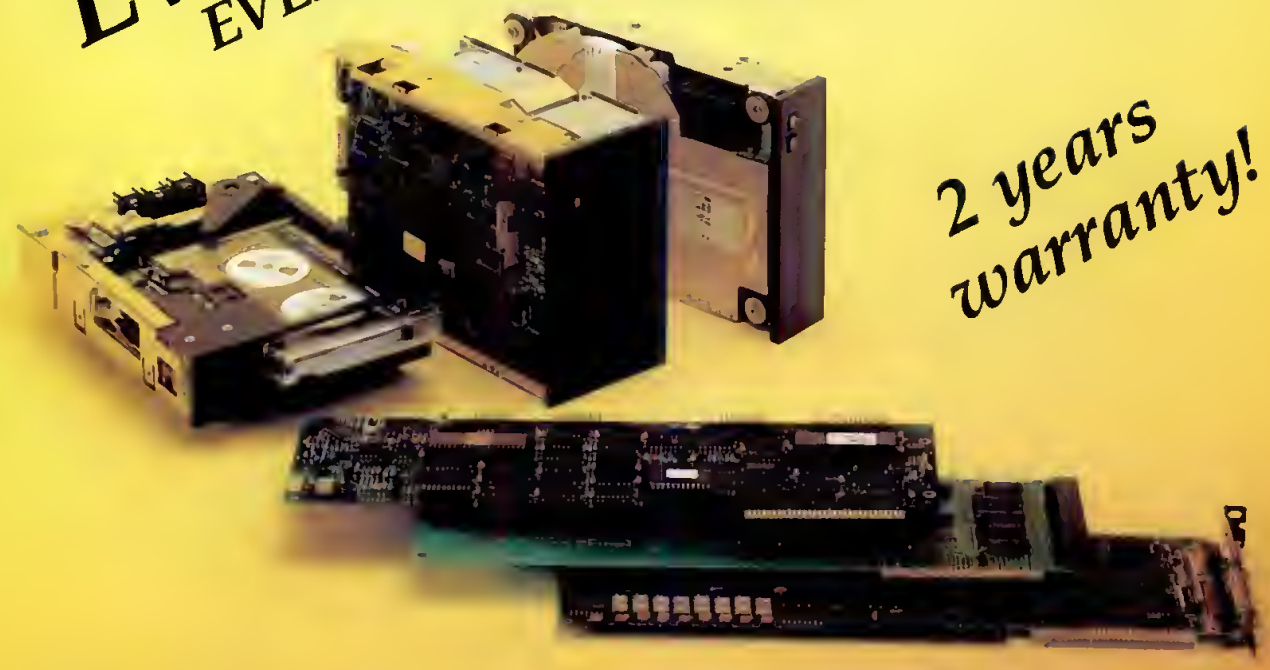

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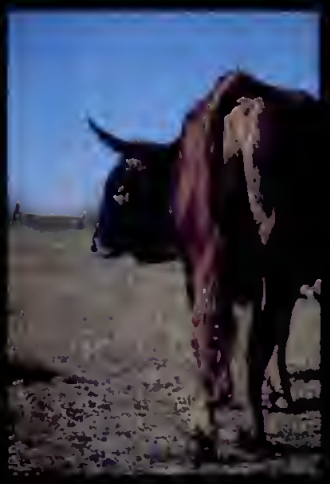

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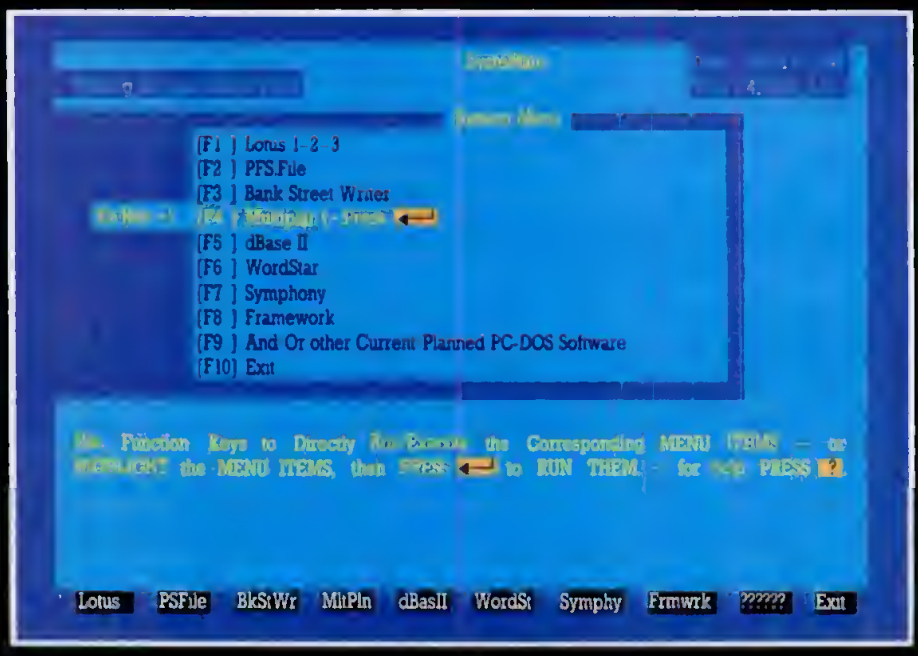

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CIRCLE 142 ON READER SERVICE CARD

Lotus Urges Others To Finish Symphony

Software and seminars give independent developers tools to create new functions

BY ROBERT SEHR

SAN FRANCISCO—Independent software developers have been asked to complete what Lotus Development Corp. officials admitted was an "unfinished" *Symphony*, with some unprecedented help from the company that had kept the rewards of *1-2-3* to itself.

"Together we can reach a market that we cannot reach by ourselves," David Gilmour, director of product planning told more than 100 software developers and programmers in San Francisco who paid $75 apiece to share some previously classified programming codes for Lotus's new integrated spreadsheet, database, business graphics, and word processing package. The San Francisco seminar followed two similar seminars held in Boston the previous week.

Lotus, which appeared out of nowhere and became an overnight success with its top-selling *1-2-3* spreadsheet, business graphics, and database program, hinted to the developers that this was an opportunity to share in the expected success of *Symphony*. "We want to leave you with the impression that *1-2-3* and *Symphony* are your best allies for successful upward growth," Gilmour noted.

Although some software houses have shared codes with major independent developers with an eye to making joint marketing agreements, this is the first time a developer has made a pitch to the entire independent software community. In its three-pronged incentive program, Lotus will make available a *Worksheet File Format* program for *1-2-3* and *Symphony*, a command-language library manager, a *1-2-3* macro conversion aid and range input add-in for *Symphony*, and, finally, add-in tools that include object codes to control *Symphony* capabilities.

However, Lotus placed some limits on the availability of the developer tools. The *Worksheet File Format*—a technical description that allows the creation of files that can be read by *1-2-3* or *Symphony*—will be made available to the general public for $20. (Those who paid to attend the seminar will receive it at no charge.) The add-in tools, which allow developers to control data locations and formats, range names, and various worksheet settings, will be available on a much more limited basis.

"We want to know something about the developers who will be using these tools," Gilmour explains. "We have limited support resources, and we want to use them in the most efficient manner."

Gilmour added that developers will have to apply for the right to use the add-in tools, giving evidence of their programming expertise and their familiarity with *Symphony* and the *Symphony* command language. Developers chosen to use the add-in tools will be responsible for marketing and distributing their own products. "We will act only as a nonjudgmental information conduit."

The command-language library manager, *1-2-3 Macro Conversion Aid*, and range input add-in for *Symphony* will be distributed to the general public, but not before the first quarter of 1985. The command-language library manager will allow programmers to create *Symphony* programs that are stored and executed separately from *Symphony* worksheets. The *1-2-3* macro conversion will simplify the conversion of *1-2-3* macros into the *Symphony* command language, and the range input add-in will give *Symphony* the ability to designate part of the worksheet for data entry (as *1-2-3* already does).

Lotus's main rival, Ashton-Tate, creator of *Framework*, has not made a similar gesture to developers. "We don't have to give out any codes to attract developers," says Ron Arons, product manager for Ashton-Tate. Arons cited the large number of third-party software developed for *dBASE II* and added that Ashton-Tate has already talked to key developers to start such efforts on behalf of *Framework*.

Gilmour says that sharing *Symphony*'s object code with developers is not intended to make the package—which is already enjoying healthy sales—the industry standard. "It is a gesture of openness based on the hope that these developers can get to more markets than we can; maybe they can make better *Symphony* add-ons."

Even *Symphony*'s capabilities are not enough for the present personal computer market, Gilmour told the developers. He cited a Yankee Group study that revealed that 68 percent of personal computers are being used for an average of less than half an hour per day. "I think that's a shame," he noted. "I believe that is a threat to the growth of this industry." ■

Diablo Connects to DisplayWrite 2

NEW YORK—Diablo Systems Incorporated has a software program that will allow its daisywheel printers to work with IBM's new *DisplayWrite 2* word processing system for the PC.

The program works by allowing Diablo models that have its All-Purpose Interface feature to emulate an IBM 5218 printer, which is supported by *DisplayWrite 2*. Features supported include all word processing modes, such as boldface, shadow and underscored printing in various pitches, proportional spacing, stop codes for print wheel changes, and Diablo's dual-bin sheet feeder.

The program was fully tested with a Diablo 630 and will be tested with other models. Marketing plans will be forthcoming.

In XT Showdown, Tandy's Tactic Is Compatibility

FORT WORTH, Texas—In mid-September the Tandy Corporation made an "informal" announcement telling its retailers to expect a PC-XT compatible machine within a month. The $3,000 hard disk unit, christened the 1200 HD, includes Microsoft BASIC and 256K RAM.

With 450 Radio Shack computer stores and another 900 computer departments nationwide, the 1200 HD already has a formidable distribution system in place. The ad campaign is expected to center upon the price, which is one-third less that the cost of the XT, but Tandy sources are already saying that their new machine is "better built and more reliable" than its IBM competitor.

The 1200 HD will be sold alongside the Tandy 2000, an MS-DOS machine with a disk format that is incompatible with IBM computers. Tandy sources say that the 1200 HD has a "very high level" of IBM compatibility.

"With an aggressive price and distribution, we hope to capture a significant part of the XT market," said Van Chandler, Tandy's director of merchandising for business computers.

Chandler declined to give either an exact or expected release date, saying "anything can go wrong in the computer industry." One Radio Shack dealer confirmed that the company had promised to have the machine in stores by mid-October.

—Charles Bermant

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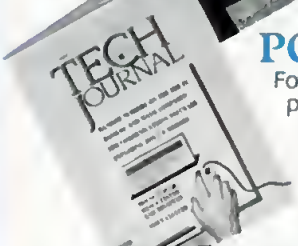

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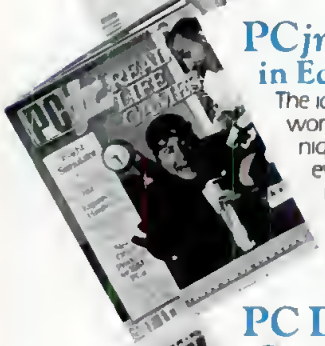

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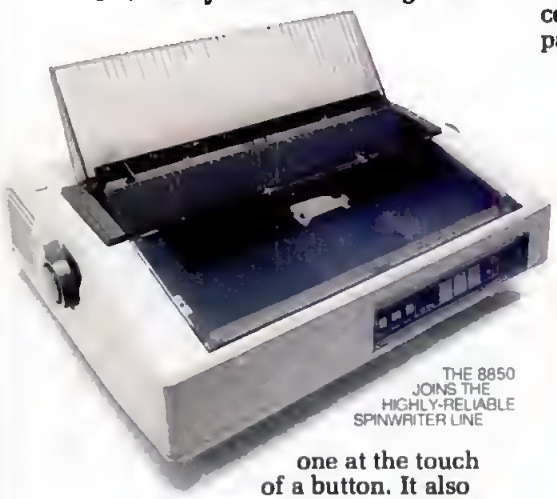

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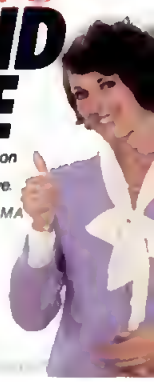

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CIRCLE 342 ON READER SERVICE CARD

Carriers Are Willing But Users Waiting on E-Mail

Western Union, MCI, GTE, ITT, Federal Express put various packages into electronic mail box

BY VIRGINIA DUDEK

NEW YORK—Electronic mail is in—almost.

While communications experts offer mixed reviews on the immediate profitability of electronic mail, the long-run prospect is that vendors with enough money to ride out the lean times will see hefty returns once electronic mail becomes as ubiquitous as the telephone.

While the major vendors now average between 500,000 and 2 million messages per month, the portion of the market currently using any system amounts to less than 2 percent of potential users. Whether electronic mail will get integrated into the fabric of daily life is a question electronic mail's participants must gamble with. However, the situation improves with each additional personal computer user.

"When people say electronic mail is not doing well, the problem is their view of the market," says Steve Caswell, a principal at Trigon Systems Group, a Toronto, Ontario, consulting firm. "People's communications habits will change; it has nothing to do with electrnnic mail."

Caswell maintains that since 1980, all the elements of an electronic mail system have been in place. Although recent reports of major electrnnic mail carriers such as Western Union indicate low returns on current operations, Caswell says that electronic mail will take off. "If you intend to be a player, you've got to be there now."

Those big companies include established communications firms such as Western Union, ITT, GTE, and MCI Communications as well as overnight courier Federal Express. Caswell doesn't discount computer giants AT&T and IBM either.

E-COM Access

Even the U.S. Postal Service tried to establish an electronic mail service, but with limited results. E-COM (electronic computer originated mail) was introduced in January 1982 as a service for volume mailers who could send mail from data stored electronically. But E-COM had some limitations that prevented wide acceptance: users had to send at least 200 letters on the service, and they didn't have the nption of inserting business reply envelopes. Despite the host of software packages written tn compensate for the complex set of E-COM user commands, E-COM failed to live up to Postal Service expectations.

On June 1 the Postal Service announced that E-COM was open to bids from private parties wishing to buy or lease the system. Most likely, one or a group of companies that have developed E-COM software packages will assume management of the system in early 1985.

In the meantime, the future of electronic mail lies in the private sector and depends on the durability of the major telecommunications and electronic mail players. Observers estimate revenues from the overall services associated with electronic mail will be in the $5 to $10 billion range by the mid-1990s.

PCs Help

"Electronic mail is finally being perceived as a viable technology," says Randy Sherman, vice president of telecommunications at Creative Strategies, Inc., a San Jose, California, marketing research firm. "The installation of a base of personal computers, the increase in user friendliness, and the inefficiency of the postal mail system are fnrcing users to seek alternatives. Electronic mail will make a stronger shnwing as the applications, databases, and software provided by major companies make it more practical.

No one company will dominate the electronic mail market.

"There will be room for many," says Nina Berns, product marketing manager for Transend Corporatinn, a San Jose software publisher and hardware manufacturer. "Standards will be developed with the cooperation of most of the companies to handle mail interactively. Eventually, it will not matter if you send mail between different services."

Transmitters

Caswell points tn a conference held in November on the implementation of technical and market standards, sponsored by the International Telephone and Telegraph Consultative Committee, the standards-making arm of the International

(continued)

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—Jane Mintzer

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CIRCLE 370 ON READER SERVICE CARD

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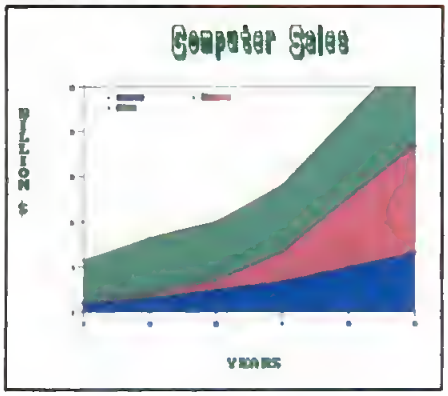

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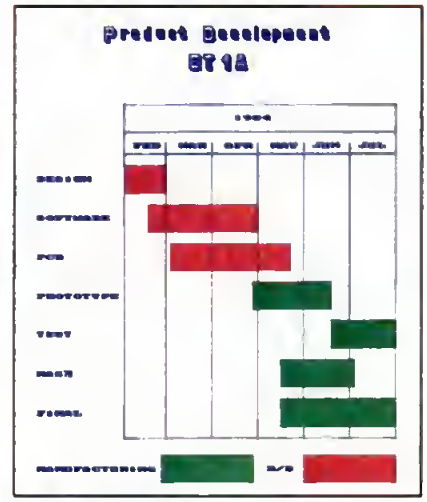

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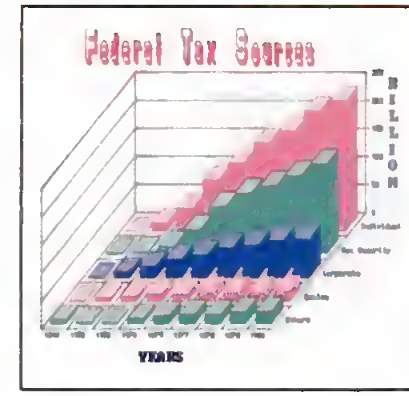

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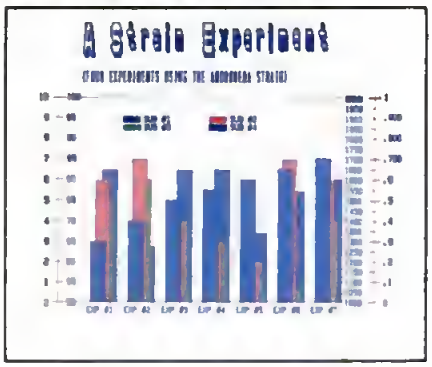

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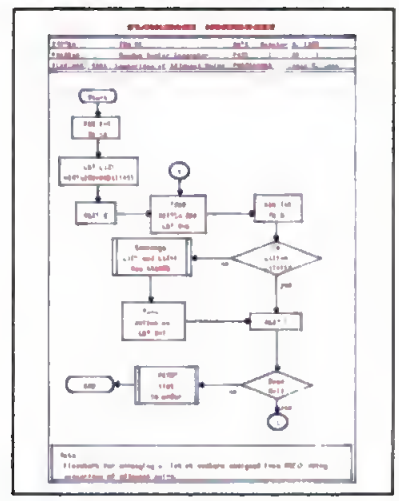

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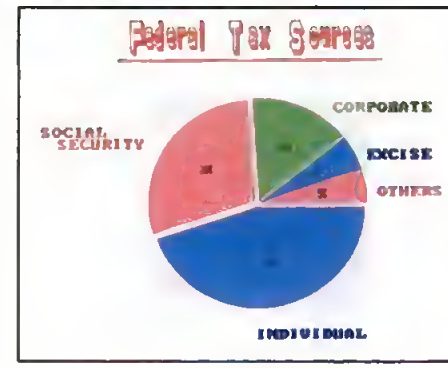

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CIRCLE 134 ON READER SERVICE CARD

Electronic Mail *(continued)*

Telecommunications Union.

Here are the major electronic mail carriers:

• Western Union—The EasyLink Instant Mail network can send and receive messages using a personal computer, microcomputer, or word processor equipped with modem and communications software. Subscribers can send messages throughout the world to a receiver's electronic mailbox or via several modes of hard copy: next-day Mailgrams, two-day E-COM delivery, first-class mail delivery of a computer letter, four-hour telegram, overseas cablegram or overseas priority letter delivered the next day by the British Post Office in the U.K. Like MCI Mail, EasyLink can operate between incompatible computer systems.

Western Union also has a communications software package, EasyLink Instant Mail, to help users manage word processing, address management, and disk filing on their personal computers. (EasyLink reports a strong lead in the market with a recorded 2 million message transmissions per month.)

• ITT—Direct Distance Dialing (DDD) allows owners of word processors, computers, or telex machines to send electronic messages to another similarly equipped terminal. The telex number is the code that identifies senders and recipients, although messages are sent over regular phone lines and not over the telex line. Messages are transmitted by modem to ITT's Timetran terminal and are then sent to the recipient. If the line is busy, messages can be stored in Timetran and then called upon when the recipient is ready to read incoming messages. DDD also has an interactive feature that transmits live messages overseas.

If the recipient does not have a computer to receive messages, telex users can send hard copy via ITT's Speedmail. It currently sends approximately 800,000 messages a month.

• GTE—Telemail sends messages in hard-copy form to other Telemail subscribers and to nonsubscribers. It delivers messages to any terminal connected to a domestic or overseas telex network, to the Western Union TWX network, as well as to any terminal linked via leased line to the Telenet public data network in the U.S. and other public data networks around the world. It also delivers on a dial-out basis to terminals with automatic answering equipment.

• MCIMail—MCI announced its electronic mail service in September 1983. Owners of personal computers or word processors can write messages off line and then send them via modem. Messages can be delivered either to another word processor or PC instantaneously, or as hard copy in 4 hours or overnight, or by first-class mail delivery.

MCI recently announced the MCI *Mail Access* software program for the IBM and compatibles. (See related story.) MCI also offers volume mail discounts and can include business reply envelopes and inserts if requested. Cost is $1 for a 7,500-character electronic letter, $2 for a printed letter delivered by the Post Office, $6 for overnight copy delivered by Purolator, and $25 if delivered within 4 hours by Purolator. Additional "MCI ounces" of 7,500 characters each cost $1 extra.

You can send messages between incompatible computers via MCI, and also to any telex machine. MCI sends about 700,000 messages each month.

• Federal Express—Zapmail, a facsimile transmission service, delivers documents within 2 hours. The document is physically picked up and taken to a Federal Express center, where a reproduction or "fax" of the document is transmitted to the nearest home office of the recipient. The document is then delivered by hand. The cost is $35 for one to five pages, and $1 each additional page if Federal Express picks up the package. The cost is $25 and $1 for each page over five if the customer takes the document to the Federal Express transmission site. The time allowed for delivery is then reduced to 1 hour.

Federal Express reports sending 6,500 Zapmail documents during its first month of operation. ■

PC Relational Database? New Answer Is Oracle

Users can either up or download PC applications from (or to) minis, mainframes

BY ROBIN WEBSTER

SAN FRANCISCO—Oracle Corporation has announced a version of its relational database that is "fully functional" for the IBM XT/AT systems and compatibles. The new version of *Oracle* allows dissimilar PC and mainframe systems running *Oracle* to share data, thanks to new networking software.

Oracle developed its original version of the database in the late 1970s. It claims that the product is "totally" compatible with IBM's own SQL/DS and DB2 mainframe databases. The high degree of compatibility is not surprising since *Oracle* developed the database according to IBM's own early SQL/DS specifications.

Now the company has introduced its PC-compatible *Oracle*. "We have managed to transport the full power of our larger *Oracle* relational database systems down to IBM XT, IBM PC AT, and similar machines," says Larry Ellison, president of Oracle Corporation. "Although we had to substantially rewrite the *Oracle* source code so that it could work well within the MS-DOS environment, nothing has been lost."

Big Capabilities

According to Ellison, "the user gets the same relational database facilities, the same report writing capabilities, and the same applications generator support. The mainframe, minicomputer, and microversions are all functionally identical."

The minimum hardware required to use *PC Oracle* is an IBM XT/AT with 512K of RAM. You'll need a 10-megabyte hard disk with at least 3 megabytes of free space, and one floppy drive.

What's important about this new version is that you will now be able to develop *Oracle* applications on, say, a mainframe and then download them for use on a standalone PC. Alternatively, you could develop applications on your PC.

Special networking software, called *Oracle Link*, makes the transfers possible. However, *Oracle Link* is not a simple file transfer program. It allows you to issue "real" database queries to remote *Oracle* databases. You can thus transport complete or partial database tables and user views between *Oracle* systems.

Squeezing *Oracle* to fit on the IBM XT and PC AT took about two years. The company had to create new software development tools to do the job. "The closest we had come to putting *Oracle* onto smaller computers was when we introduced versions that would work in 1 megabyte of RAM under UNIX," explained Ellison. "In attempting to develop an IBM XT/AT version, we looked at virtually every independently developed C compiler, editor, and debugger. We did consider using the Lattice C compiler at one time. In the end, though, we decided to develop our own internal C language tools."

PC Oracle costs $1,000 per user, but there is a minimum order of six user licenses (totaling $6,000). The price per user is close to that for bigger machines that run *Oracle*. The IBM 3084 version supports about 90 users and costs $96,000; the Digital Equipment Corporation VAX 780 version supports 40 users and costs $48,000.

Oracle said that it would begin shipping the IBM XT/AT and TI Professional versions of *PC Oracle* in October. ■

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CIRCLE 118 ON READER SERVICE CARD

PRODUCT REVIEW

Forwarding Mail with InfoPost via E-COM

BY BARBARA KRASNOFF

InfoPost
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Bloomfield Hills, MI 48013
(313) 334-9790
(800) 445-INFO
List Price: $295
Requires: 128K, two 320K disk drives or hard disk, 300- or 1200-baud modem.

Once upon a time the U.S. Post Office tried to find a high-tech cure-all for the "Neither snow, nor rain...," bromide. They introduced E-COM (electronic computer originated mail) in 1982 to streamline the delivery of mail, especially large batches of correspondence. Using E-COM, a customer sends the text of a letter, and the addresses it should be sent to, over modem to a designated post office. The message is electronically typed, stuffed, and sent.

However, the system suffered certain deficiencies as a result of government controls and rigid operating rules. A 200-letter minimum was set for each batch of messages sent, and complex formatting guidelines made it difficult to edit and send the letters. By June 1984, the Board of Governors of the Postal Service decided to turn E-COM over to the private sector to generate more efficient handling. Now, several private firms are interested in leasing or buying the system from the Postal Service.

Software Support

But while E-COM was in its early months of operation, several software companies came up with communications packages to help customers cope with its specialized format. In spite of the changeover of E-COM to private hands, these software companies seem to be strongly supporting E-COM.

One of these designers, InfoDesigns, Inc., is betting that the new operators of E-COM will continue to be a strong market for electronic mail communications packages. "There's nothing different now that E-COM didn't provide 6 months ago," says president Richard Stahl, who recently released a package called *InfoPost*. He claims, "We have seen no negative results in sales," as a result of the June announcement.

InfoPost contains a simple word processor, an error checker (for problems in the formatting of the material), and a communications program that will send the information automatically to the appropriate post office. It also includes a program that keeps track of your available funding.

Three Ways

You can send messages three different ways using the E-COM system: via SAM (single address message), which sends a unique letter to one address; COT (common text message), which sends one message to different addresses; and TIM (text insertion message), which sends customized letters with variable information within the body of the message.

InfoPost's Document Writer word processor is a somewhat limited but easy-to-use program that works within very strict guidelines. You choose a series of commands such as APPEND, COPY, DELETE, and SAVE from the *Document Writer* menu by hitting a single letter (for example, L for LOAD, S for SAVE, etc). The program reacts to the commands instantly, without use of the Return key; so once a choice is made, you are pretty well committed.

Formatting commands are inserted into the text using the at sign (@) and an easily recognizable English language command; for example, @RETURN in front of an address specifies a return address, @SENDTO specifies the destination, and @FILE specifies a list of addresses that you can use as a separate file with whatever message is included.

The body of the text is limited to a 30-character width, and addresses can't be more than four lines in length. So if you're planning to send a letter to a company official with a title, address, and suite number, you may be out of luck. (If you don't want to use *Document Writer*, the manual gives specific instructions for using *WordStar* to prepare your message. However, the same space limitations apply.)

Once the body of the message and the necessary addresses have been registered with the software, you must then build an E-COM group file. This option checks a completed address and/or message file for format errors and inconsistencies.

The program will also tell you how many entries you have made in the file and what the cost of sending the message will be. If an error is found, the program identifies and displays it, along with an explanation of the problem.

Once the file is found to be satisfactory, you can transmit it via modem to the appropriate post office. Unfortunately, this utility has several small but irritating problems that subtract from the efficiency of the software. For example, if you are the owner of a Hayes Smartmodem, you should be able to "program" the software to automatically call the appropriate post office. However, *InfoPost* gives you 11 spaces in which to specify the phone number; if you have the type of phone lines in which you must first hit 9 to get an outside line, you're out of luck.

More Problems

Since I do have that type of phone system, I had to use the manual transmission setting with my Smartmodem. Here, I ran into more problems—and this time, it wasn't with the software, but with the manual itself.

Somehow I was left with the impression that, once connected to E-COM, I would receive the message//E-COM START and a request for my ID (in somewhat the same way that MCI *Mail* or the *Source* identifies itself when you connect). What I somehow missed (and wasted about three phone calls discovering) was that the user is responsible for typing in that initial START message.

As a matter of fact, I found the inability to change your mind in midstream to be a continuing problem in both *InfoPost* and E-COM. In *InfoPost*, there is not only the immediate commitment to any command chosen, but the fact that, once you have typed a line in the editing mode and have hit Return, you cannot correct any errors. You must save the text and go into either replace or insert mode. Meanwhile, E-COM itself is somewhat hostile to less-than-perfect typists: the E-COM system recognizes everything that is transmitted to it, including backspaces. Therefore, if you make any mistakes at all when sending your ID codes, or if you hit the Enter key rather than Control-C to signal completion, you may as well hang up—you won't be recognized as a valid customer. (According to a representative of E-COM, this isn't a problem for most users, since they first set up a utility to transmit the numbers automatically.)

As a test, I transmitted a TIM file with a return address, a short message, and three fictional destinations. Once I managed to get past the ID stage, my message and addresses transmitted fine, and the results of the test were mailed back to me. The only problem with the message itself was that it was almost to the left edge of the stationery; a representative of E-COM suggested that I indent future messages about eight spaces. However, while that could be correct with *WordStar*, it would not be possible with *InfoPost*'s word processor.

InfoPost is a fairly simple, basic software package that will probably come in handy for those who use the Postal Service's E-COM facility often. However, it would be much more useful if all those small, irritating, and avoidable problems were corrected. ■

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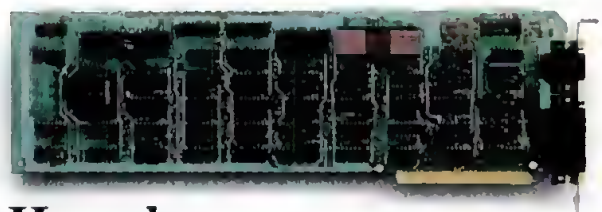

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CIRCLE 146 ON READER SERVICE CARD

Time Line Enters Decision Support Race

NOVATO, Calif.—Developers of decision support software have two common beliefs: They're convinced their produet will launch businesses to new heights—and that their produet is ultimately unique.

Time Line, a time-budgeting program recently available from Breakthrough Software, located here, is yet another voice in this chorus. *Time Line*, which tracks and schedules project resources and plans either forward or backward in time—up to 15 calendar years out, is the first in a planned series of easy-to-use, practical business programs, Breakthrough says.

The program requires 256K RAM and runs on the IBM PC, AT&T, and compatibles. It carries a $395 list price.

To run *Time Line*, a manager enters the various tasks to be performed by various personnel and how much time the tasks will take. With the entry of beginning and ending parameters, the program maps out time and personnel limits on a Gantt chart. As the project moves ahead, progress can be duly noted.

Breakthrough provides detailed help menus in *Time Line* because, according to company president William Lohse, a cofounder of MicroPro, their target group has neither the time nor the inclination to delve into detailed manuals.

"*Time Line* can easily be used without the manual," he adds. "It's for people who like to jump right into it."

Despite this claim, a novice user will not be able to run *Time Line* without the manual, which, incidentally, is written in short-story format with the tutorial commands set in boldface.

The program was written by Andrew Layman, who was working on it for several years prior to hooking up with Breakthrough. Breakthrough is located at 505 San Martin Dr., Novato, CA 94947, (415) 898-1919.

—Charles Bermant

Calendar of Events

DATE	EVENT	COMMENT	LOCATION	CONTACT
October 29-November 1	COMDEX/Europe	Hardware, software, and aeeessories.	RAI Congress and Exhibition Centre Amsterdam, The Netherlands	The Interface Group 300 First Ave. Needham, MA 02194 (800) 325-3330 (617) 449-6600
November 1-4	Bits, Bytes, and Books: The First Annual Computers and Publishing Conference	Workshops, seminars, and discussion of the computer book market.	Univerity of California La Jolla, CA	UCSD Extension University of California La Jolla, CA 92093 (618) 452-3430
November 1-4	Consumer Eleetronies and Computer Expo	Sales show featuring consumer eleetronic and computer products.	Nassau Coliseum Uniondale, NY	Expositions Inc. 33 Bell St. W. Babylon, NY 11704 (516) 293-5533
November 2-4	Regional Educational Software Informart	Seminars on educational software developments.	Penta Hotel New York, NY	National Educational Software Informarketing 225 E. 57th., 17H New York, NY 10022 (212) 688-8904
November 4-7	Eighth Annual Symposium on Computer Applications in Medical Care	Tutorials, demonstrations, and exhibits on computer applications in health care.	Washington Hilton Washington, DC	Oflice of CME George Washington University Medical Center 2300 K St., NW Washington, DC 20037 (202) 676-8928
November 11-14	The Information Nation: New Aetors, New Factors	Presentations on technology information and trade trends.	The Sheraton Palace San Francisco, CA	Information Industry Association 316 Pennsylvania Ave., SE Washington, DC 20003 (202) 544-1969
November 14-18	COMDEX	Hardware, software, and accessories.	Las Vegas Convention Center Las Vegas, NV	The Interface Group 300 First Ave., Needham, MA 02194 (800) 325-3330 (617) 449-6600
December 4-6	Microcomputer Database Management Systems	Seminars on how to select and use a micro-DBMS.	Dupont Plaza Washington, DC	Software Institute of America 8 Windsor St. Andover, MA 01810 (617) 470-3880

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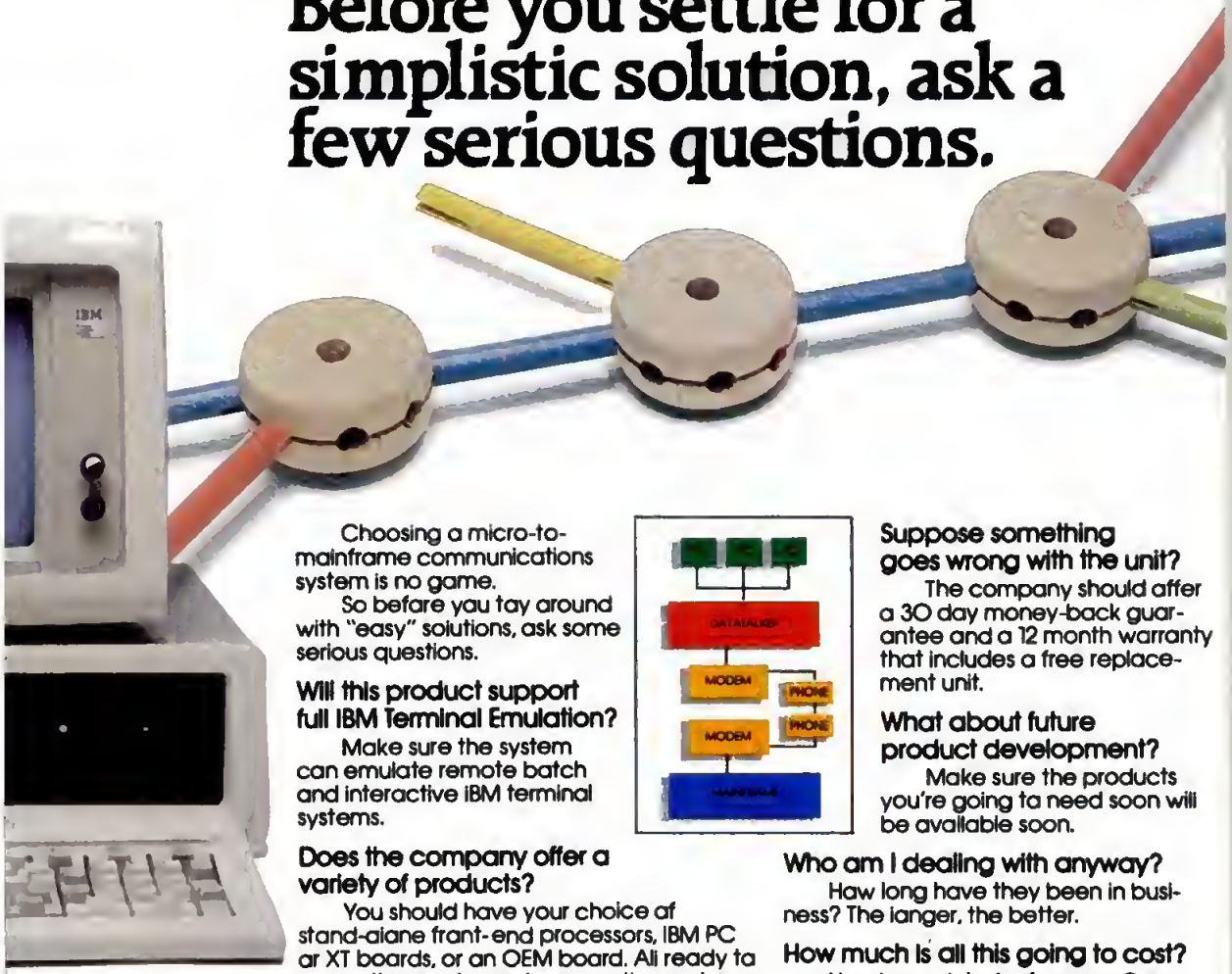

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So before you toy around with "easy" solutions, ask some serious questions.

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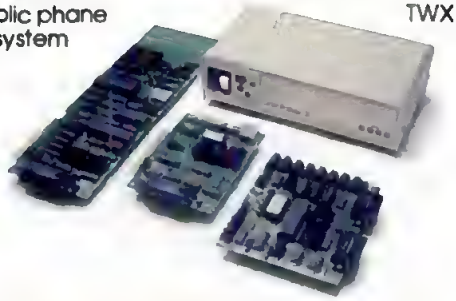

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CIRCLE 185 ON READER SERVICE CARD

Computers Strike Below the Belt

Even those of us at *PC Magazine* sometimes feel that computers have gone too far. I recently received a piece of alarming junk mail that a computer had personalized by inserting Langdell-specific data into a form letter. The letter greeted me:

"Do me a favor, Mr. Langdell. Put on and wear the 2 pairs of Poplin Slacks I'm sending to your 1 Park Ave address next week. Wear them hard—anywhere around New York—to the office, golfing, boating."

Computer-generated advertisements are nothing new, but this letter made me wonder. How did a clothing company get my work address? Were two pairs of pants actually on their way to me? Such nerve! What made them so sure I'd want to buy those slacks? Don't they know there's a law that lets consumers keep unsolicited merchandise without paying the sender a penny?

Then a frightening thought struck me. If the computer was automatically mailing out pants, how did it know my waist size? Did it tap into a secret, nationwide database of personal measurements? And how was my waist size recorded in the first place? At night, while I slept?

And how current is that database, anyway? Does it know I added a few inches to my beltline last year, or that I've recently started to exercise?

After seething with paranoid fantasies about Big Brother's latest triumph, I breathed a sigh of relief when I read the letter's last page:

"Now—so I can send your new Poplin Slacks in the size and colors you want, won't you tell me your choices on the handy postage-paid card enclosed."

When the computer-generated missive finally quelled my Orwellian fears, I was not only relieved, I felt grateful. I quickly filled out the card and ordered those lightweight pants. Only later did I realize my folly: I had given them exactly what they wanted. Now the computer knows about my 34-inch waist!

—James Langdell

Multi-User Board First AT Product

NEW YORK—Three months before IBM's scheduled introduction of the hardware and DOS 3.1 operating system that will give the PC AT multi-user capabilities, an Atlanta retailing and manufacturing firm made its own system available.

Computone Systems's AT-VANTAGE immediately upgrades the AT into a multi-user system with up to nine workstations.

"The AT was introduced as a personal computer," Tim Sullivan, Computone's business systems vice-president said. "We have turned it into a true business product."

The AT-VANTAGE system, which uses one board to accommodate multiple machines, has been in the works for almost a year. Due to the fortuitous timing of IBM's AT release, AT-VANTAGE is the first product to be introduced specifically for the new upper-end PC.

While Computone declined to disclose AT-VANTAGE's list price, company president Jay Rosovsky said that three AT workstations equipped with the new board would "run in the neighborhood of $16,000 to $18,000."

Computone is now involved in retail sales as well as manufacturing; among its holdings is the upstate New York Computer Room chain. A recent company report boasted that 80 percent of its revenues have come from products and services developed in the last 18 months.

Rosovsky conceded that the new board competes against Computone's current hardware line, specifically its own multistation computer system. Computone Systems, Inc., can be contacted at One Dunwoody Park, Atlanta, GA 30338, (404) 393-3010.

Next in AT Line

Following Computone's announcement, MAI/Basic Four Business Products (P.O. Box 8350, Albuquerque, NM 87198, (505) 266-5811 and Mountain Computer Inc. (300 El Pueblo Road, Scotts Valley, CA 95066, (408) 438-6650) also introduced AT accessories.

Basic Four's two upgrade kits are designed for use on the AT with Basic Four accounting software. Part of this update is an individual user file-locking system, prohibiting simultaneous changes to a record.

The list of new AT products is small but growing rapidly. One of the most interesting is a tape backup system for the AT, developed by Mountain Computer, for use with either the floppy or the hard disk. The new system can either save several smaller programs on one tape or use multiple tapes for hard disk backup.

—Charles Bermant

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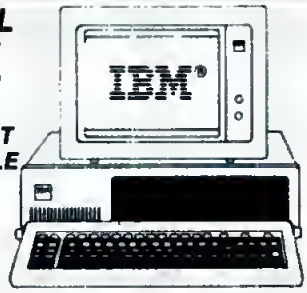

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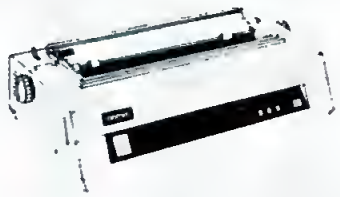

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People

Fred Collopy and Don Huesman

A Philadelphia experiment leads to more organized desks and dreams of a Jaguar

BY CHARLES BERMANT

PHILADELPHIA—"It was like trying to buy a gun."

Fred Collopy is recalling 1972, when he strolled into a Wang district office, in long hair and jeans, and attempted to purchase a Wang 600. He pulled out a $4,500 certified check, but the salesman said they didn't sell to "people"—a company purchase order was required. Finally the sale was made. Collopy, then a financial analyst working with the state of Ohio, was well on his way to computer heaven.

Twelve years later, 36-year-old Collopy is lord of his own castle. As producer of the *Desk Organizer* program, he and his staff of six occupy seven rooms on the top floor of an imposing West Philadelphia structure, complete with stone turrets. But the relative calm of his Conceptual Instruments could be short-lived; *Desk Organizer* is the subject of a major market thrust by Warner Communications' software division.

Collopy is the first to delegate the credit and insist he is not a typical company president. Would a corporate giant take the time out to pick up an interviewer at the train station? He shares available limelight with Don Huesman, 33, coauthor of *Desk Organizer*. The two, Collopy maintains, share a yin and yang relationship, but he can't say who is which.

"We view programming as collaborative," Collopy says. "It's more like making a film than writing a book. The six of us constitute the development crew—everyone crosses boundaries. No one is called programmer, although everyone does some programming. This is one of the things that led us to Warner. They appreciated that vision, which is not so different from what goes into films or records."

Photo: Scott D. Green

Fred Collopy and Don Huesman

The two partners met while attending Kentucky's Thomas More College during the 1960s. Huesman subsequently became involved in public interest and alternative energy work, while Collopy ended up as an instructor in Wharton's School of Decision Sciences. Collopy recruited his old friend when he founded the new company because "we needed an organizer, someone smart and quick who was not enamored of computing."

At one point Collopy was planning to be a monk, though he was never "finished, confirmed, and packaged." One employee, when asked how this background may have affected him, jests that Collopy "gets a little preachy sometimes."

"There is not a whole lot of difference between a medieval fellow bending over a manuscript with a quill pen and the modern counterpart, hunched over a CRT and a keyboard at 3 a.m.," says Huesman.

When asked how his background has influenced him, Collopy only says "I don't swear as much as these other m——s."

Not a Company

Collopy and Huesman say they don't want to be "a software company," no matter how many copies of *Desk Organizer* they sell. Instead, they call themselves "conceptual producers" who will create "new consumer perceptions of technology."

"Our product stands out because it captures something about the way people really work. People buying a personal computer are looking for it to take away some of the things that clutter up their desks. We developed a way to tuck information away, imitating a mechanism that people already knew. We then layered the mechanism and made it look familiar."

Joking about their coming success, Collopy and Huesman claim they "only want to make a decent living without making bombs." Conceptual Instruments is still a place where customers seeking support will often end up talking to the company president.

"Right now, no lines are lit up," Huesman said. "This tells you that not a lot of people are having trouble with the programs."

The first version of *Desk Organizer* was developed on cassette for the Apple II but never released. Various other mutations of the program followed, and Conceptual Instruments soon began to concentrate on the PC market.

At the same time, Warner was looking for a good piece of software it could rally behind. All was finalized at COMDEX, Winter 1983. The *Desk Organizer* MS-DOS version is expected to hit the market this month (the current edition uses its own operating system).

In the Future

Although they affect atypicality, Collopy and Huesman are predictably secretive when it comes to future plans. They do say they will not pursue "traditional well-honed software categories." One idea is to develop a "motion-picture version of analysis, in the same way that a spreadsheet is a photograph." "There is a need for this," says Collopy, "and the math exists."

Huesman, for his part, has seen his lifestyle change in the past few years. "I used to spend all my time sitting next to a natural lake. Now I get to talk to 600 dealers over the next few days," he says. "And I used to be interested in world peace, harmony, and actualization. Now I'm after a new Jaguar with a good sound system and a briefcase full of $20 bills." ■

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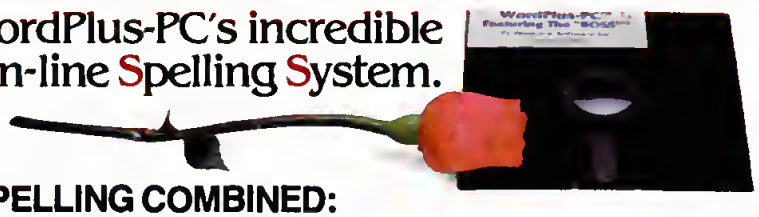

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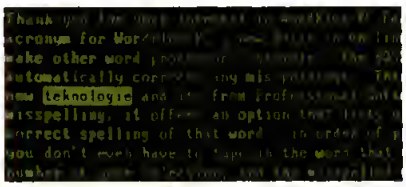

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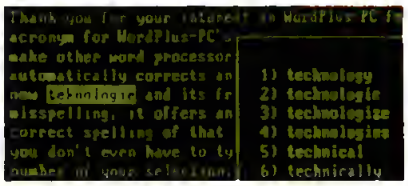

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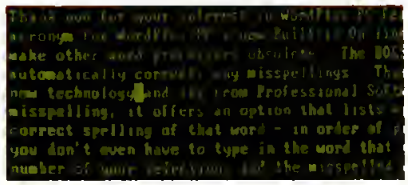

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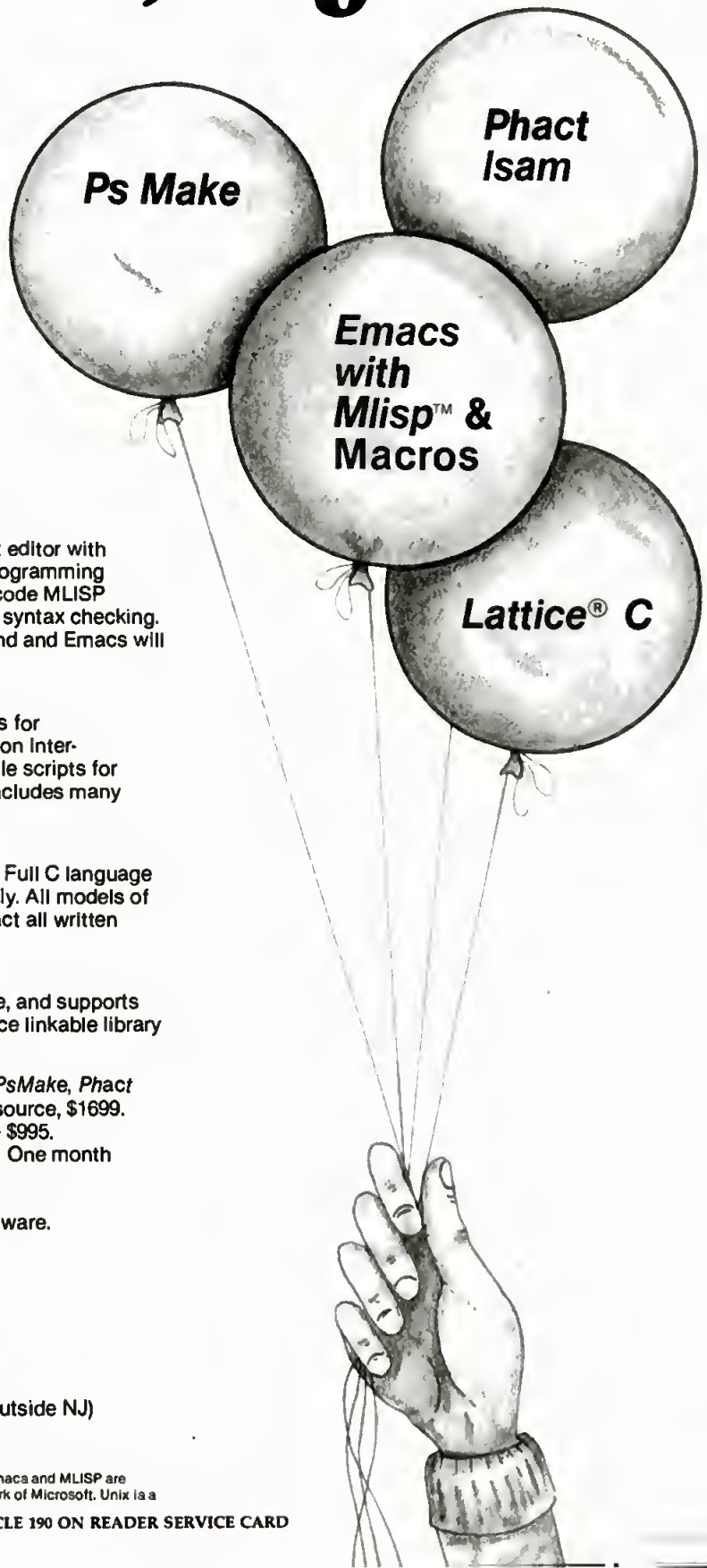

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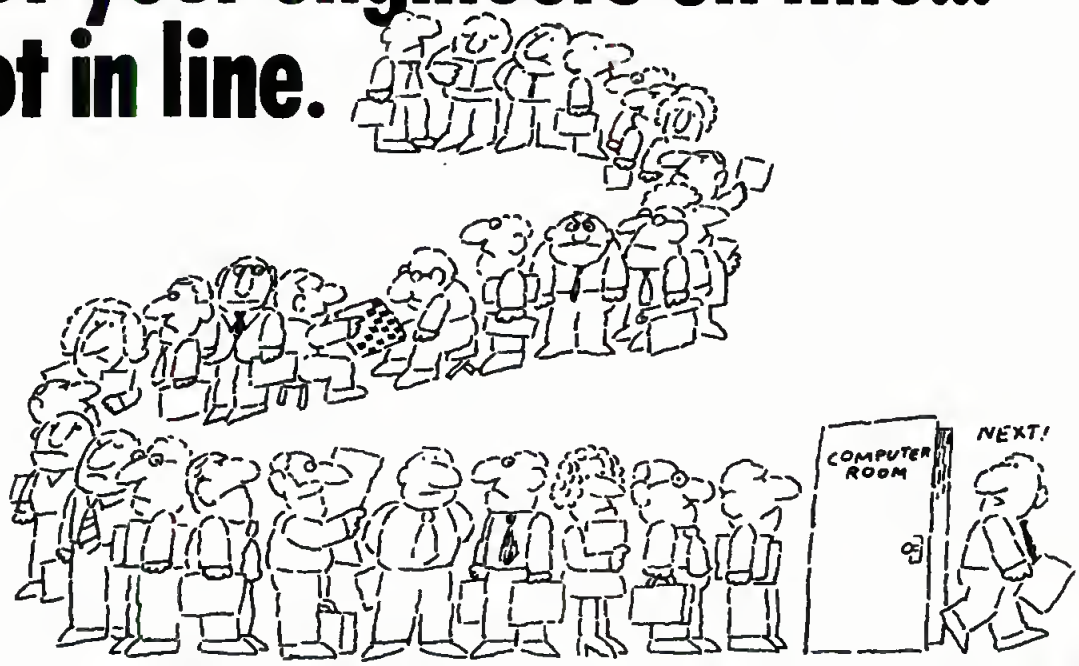

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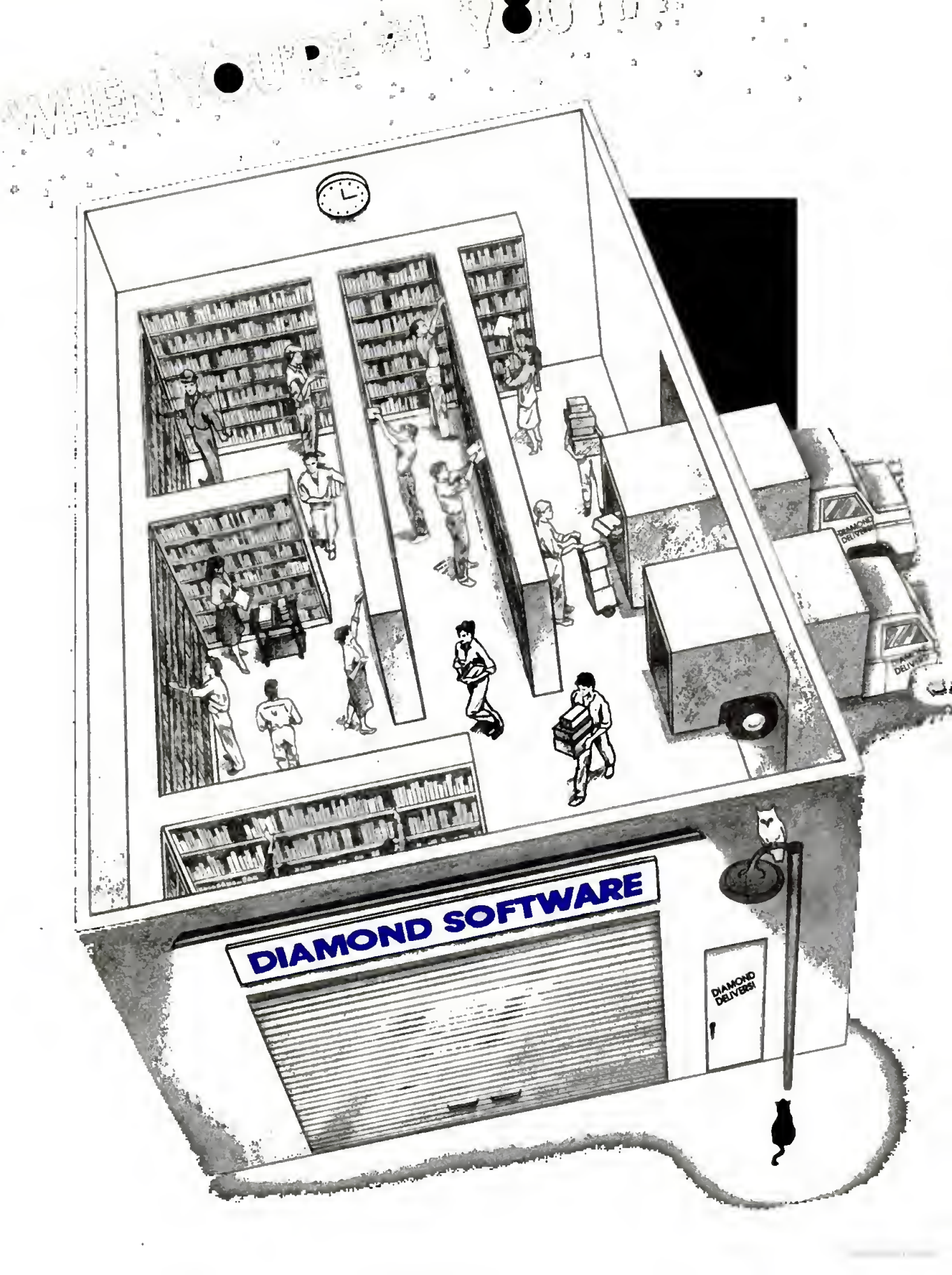
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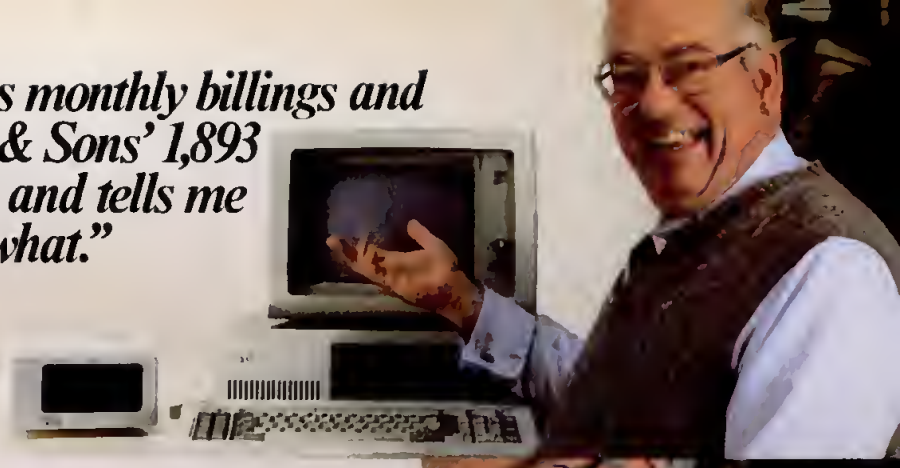

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Bill Machrone

Then the chairman of the DP manager's company gets a call from the IBM regional manager. He's invited to lunch at the club, a round of golf, or an afternoon of sportfishing.

The regional manager turns out to be extremely well informed about the nature of the chairman's business. He knows the challenges that lie ahead and can talk intelligently about where the business will be in 5 years. After the appropriate amount of socializing, the regional manager informs the chairman gravely, "We believe that one of your people is about to make a poor decision, one that will hurt your business."

The hapless DP manager never knows what hit him. Whether it ends in demoralization, disgrace, or demotion, events will not go as he planned. Nothing personal against him on IBM's part—the sales team is just doing its job of account control.

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Dealers can (and must, if they are to be good ones) carry more than the IBM line. This is a threat to IBM's account control. The only way IBM can preserve its dominion is to compete with dealers that sell its own products.

A businessman goes into an IBM dealership. He knows that he needs to automate his inventory, and friends have advised him to buy IBM. This makes sense to him: All of his firm's typewriters are Selectrics and Electronics, and he's surveyed the field and realizes that PCs dominate the small-business applications market.

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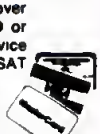

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PRICING MADNESS

Once again, as Federal Express picks up our ad at the very last millisecond before this issue's advertising deadline, ***here we sit with dozens of price reductions and new product announcements which have arrived too late for us to let you know.***

Why, our ad manager asks, do we always go through a last minute price update frenzy, just seconds before our ad is due at the publisher, when we know that despite our heroic effort, ***many of these products will cost even less by the time you read this ad.***

How he asks, can we get a crystal ball to forecast what fantastic promotions and specials our suppliers are going to offer from now to the date this ad gets to the newsstand ***over two months from today?***

Well, we decided that he has a good point. While we'll still keep getting our grey hairs and ulcers from last minute revisions, we will start publishing this notice and ask our readers to make a simple check. Look at any four back issues of this magazine (yes *we're in every one)* and track the prices on the most popular products. ***You will see that many drop with every issue.*** Most of these price changes were instituted well before the issue was printed and ***our members always pay the lower price.*** This should prove that this notice is much more than hype.

Given the current madness in the PC industry with its spur of the moment pricing and instant product introductions, ***you will find it always pays to call for our latest prices.*** You will be glad you did.

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Open Systems *P/O Sales A/R INV G/L A/P Team Mgr.*	370.00*ea
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10 SPECIAL SAVINGS BULLETINS—THE PRINT-OUT—The NETWORK seeks every opportunity to save money for its members. We buy excess dealer inventories, and store bankruptcy closeouts regularly. We then turn around and make this merchandise (only top quality name brand products) available to our members at fantastic savings via THE PRINT-OUT, our newsletter and savings bulletins.

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13 CORPORATE ACCOUNT PROGRAM—Almost 50% of The NETWORK'S members are corporate buyers and users *(see opposite page left).* The NETWORK can establish open account status and assign designated account managers to expedite orders, and coordinate multiple location shipments.

14 QUANTITY DISCOUNTS—For large corporations, clubs, and repeat or quantity buyers The NETWORK can extend additional single order discounts, when available to us from our manufacturers and distributors.

15 PRICE PROTECTION—The PC Industry is crazy!! Prices change not yearly or monthly or even weekly but often day by day! These changes are sometimes up *but are mostly down!!!* **THE NETWORK GUARANTEES THAT IN THE EVENT OF A PRODUCT PRICE REDUCTION, BETWEEN THE TIME YOU PLACE YOUR ORDER AND THE TIME THE PRODUCT SHIPS YOU WILL ONLY PAY THE LOWER AMOUNT!!**

CIRCLE 535 ON READER SERVICE CARD

staff and an in-house programming staff. He also maintains contact with free-lance systems analysts and programmers in the area. After hearing the businessman's description of how he operates, the dealer recommends a small network of PCs, a multi-user database manager, and custom programming. His consultants feel that the way the businessman ages and values his inventory cannot be handled by any of the commercial packages they've seen. Furthermore, the available packages are not adapted to multi-user access over a network.

It goes without saying that the businessman also consults with his IBM rep. After all, he's a happy customer. She reviews his needs and comes up with an all-IBM solution. She recommends the database manager in IBM's new software lineup—no custom programming.

Now the businessman is in a quandary. The IBM proposal sounds simpler, costs out lower, and appears that it might be delivered faster. Is the IBM rep right? Is the dealer right? Unfortunately, there's only one way to find out for sure. And equally unfortunately, the businessman is probably most likely to choose IBM over an independent dealer, even when he shouldn't.

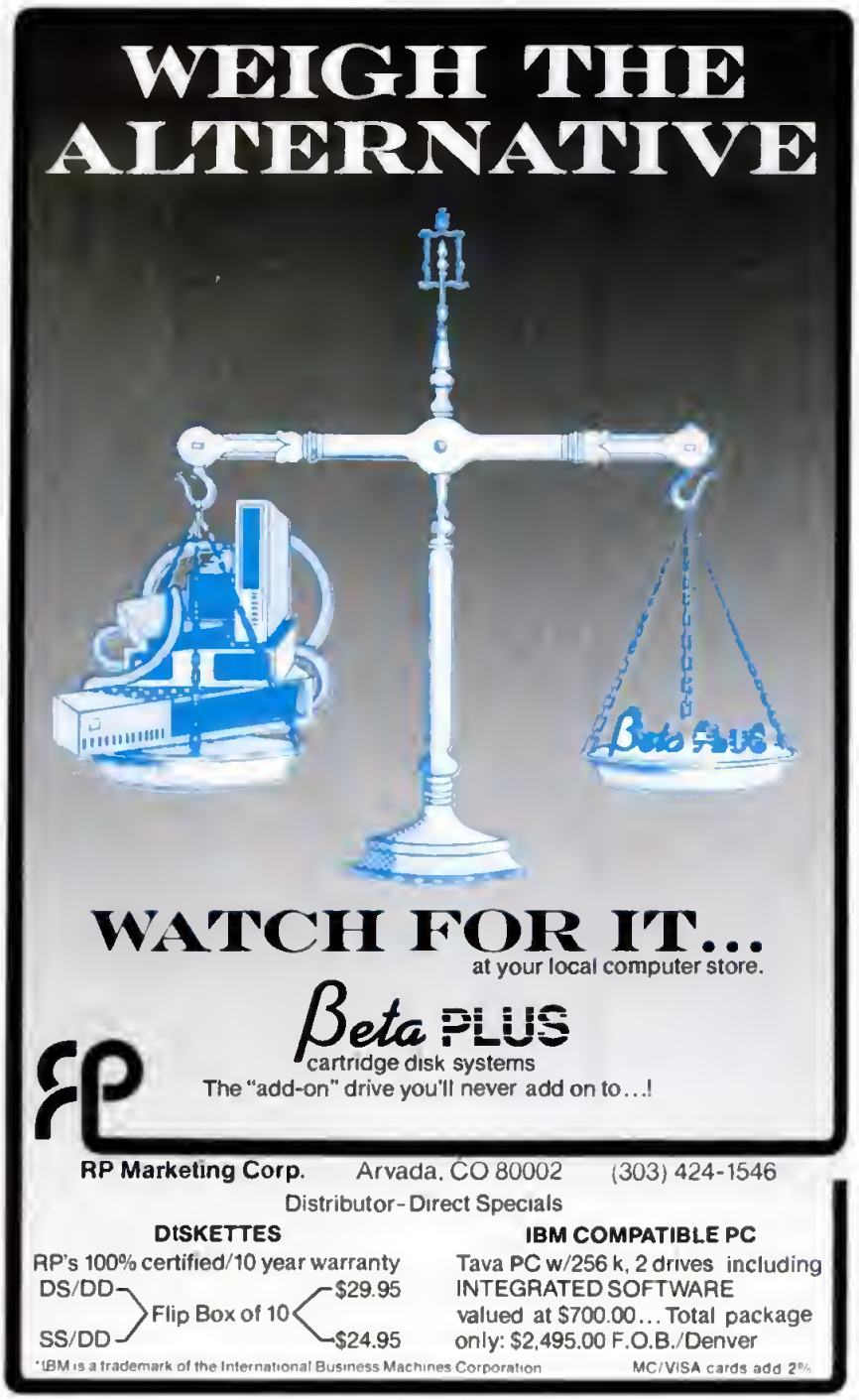
If IBM can sell better than most dealers, retail stores will close. Tailored solutions will be harder to come by, and innovative products will have fewer outlets. It will hurt our industry.

Trust Me

There's another factor. IBM was recently given a clean bill of health by the U.S. Justice Department when it found longstanding antitrust charges against the company to be without merit. With this new-found freedom, though, it's just a matter of time before IBM winds up in court again. Oh, it'll take years, believe me, but it's inevitable. No company as big, aggressive, and successful as IBM can avoid it.

The next time IBM is in the dock, some of the complaints will be aimed at its attempted domination of retail distribution channels. Mail-order companies face a similar problem as IBM continues to offer more and more products through its direct-sales operation.

So do your part. Help keep IBM out of court. Patronize your local dealer, or buy something by mail. ■



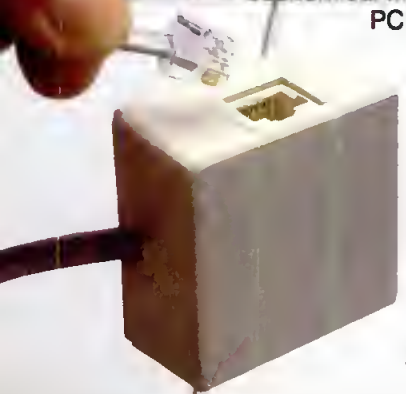
CIRCLE 396 ON READER SERVICE CARD

Introducing AST-PCnet II.

Now PC networking is as easy as plugging-in your phone.

The advantages of Local Area Networks (LANs) are well known. Existing personal computers can be tied together to share information and expensive peripherals such as disks and printers.

Now AST makes networking easier and more economical than ever before. With AST-PCnet II, you simply insert the PCnet II board into an I/O slot in your IBM PC or XT. Then connect the PCnet II "twisted-pair" cable to the main network cable using a standard modular "telephone jack."



The same kind of jack that's used on your telephone. To move your PC from one point to another on the network, simply plug in at the desired location. It's that easy.

With AST-PCnet II, anywhere from 2 to 160 PCs can be interconnected. Standard PC-DOS commands are used to access remote drives and printers. And dedicated file and print servers are not required, because shared PCs also function as standard workstations.

We're AST, the world's leader in communications and enhancement products for the IBM PC. To find out how AST-PCnet II can expand your IBM PCs and XTs into a reliable, versatile LAN, call or write AST Research, 2121 Alton Avenue, Irvine, California 92714. (714) 863-1333. TWX: 753699ASTR UR

AST RESEARCH INC.

AST-PCnet II is a development of AST Research Inc. Software protocols are based on technology licensed from Orchid Technology Inc.

AST-PCnet II Local Area Network

CIRCLE 104 ON READER SERVICE CARD

Will your plug-in modem plug you in?

Pick out any plug-in modem card. Look it over. Study it. Is it truly compatible with your computer? Does it offer the features you want? Is it a good value?

Maybe not. Unless you pick the AJ Connection from Anderson Jacobson.

The AJ Connection—complete with all four comports—provides more communications capability than any other plug-in modem in its class. And it works on any IBM bus-compatible computer. IBM* PC. IBM XT. Compaq.* Columbia.* TeleVideo.* Fujitsu.* Eagle.* And more.

Your connection to the outside world.

An AJ Connection system will link your computer to data banks, mainframes, remote terminals, or other PCs. It dials up to 40-digit sequences, answers calls, and disconnects. All automatically. All from one board.

The asynchronous communications adapter that many systems don't include is standard. So you get an extra port for simultaneous recording and printing. Plus a built-in speaker. All without overlapping into adjacent expansion slots.

AJ Connection comes complete with plug-in modem, cabling, software, and full documentation.

See us at COMDEX/FALL '84.
Nov. 14 - 18.
Booth 2124.

Powerful software.

Crosstalk™ XVI auto-dial software lets you program up to 40 function keys for quick log-on to remote systems. It displays transmittal times, disk space, and other necessary data. Lets your system password-protect your data. It even allows terminal emulation.

Best of all, Crosstalk is easy to use. You simply follow the menus and prompts.

Ask your computer dealer to plug you into the AJ Connection. The latest in a long line of reliable communications solutions from AJ.

Or call us direct. Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, California 95131. Regional offices: Chicago, IL (312) 671-7155; Fair Lawn, NJ (201) 794-9316; San Jose, CA (408) 263-8520. Dealer inquiries welcome.

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CIRCLE 126 ON READER SERVICE CARD

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Having problems with retrieval?

You need software insurance.

Diskettes are fragile, and when a protected program is damaged, the results are expensive and inconvenient. If you have a backup diskette, though, you can have your Apple, IBM or compatible computer back on line within seconds... affordably. That's software insurance.

Copy II Plus (Apple][,][Plus, //e)

This is the most widely used backup program for the Apple. Rated as "one of the best software buys of the year" by InCider magazine, its simple menu puts nearly every disk command at your fingertips. The manual, with more than 70 pages, describes protection schemes, and our **Backup Book**™ lists simple instructions for backing up over 300 popular programs. A new version is now available that is easier to use and more powerful than before. Best of all, Copy II Plus is still only $39.95.

WildCard 2 (Apple][,][Plus, //e)

Designed by us and produced by Eastside Software, WildCard 2 is the easiest-to-use, most reliable card available. Making backups of your total load software can be as easy as pressing the button, inserting a blank disk and hitting the return key twice. WildCard 2 copies 48K, 64K and 128K software, and, unlike other cards, is always ready to go. No preloading software into the card or special, preformatted diskettes are required. Your backups can be run with or without the card in place and can be transferred to hard disks. $139.95 complete.

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These products are supplied for no other purpose and you are not permitted to utilize them for any use, other than that specified.

CIRCLE 112 ON READER SERVICE CARD

Copy II PC (IBM)

This is THE disk backup program for the IBM PC and PC/XT that backs up almost anything. Others may make similar claims, but in reality, nothing out performs Copy II PC... at any price. Copy II PC even includes a disk speed check and is another "best buy" at only $39.95.

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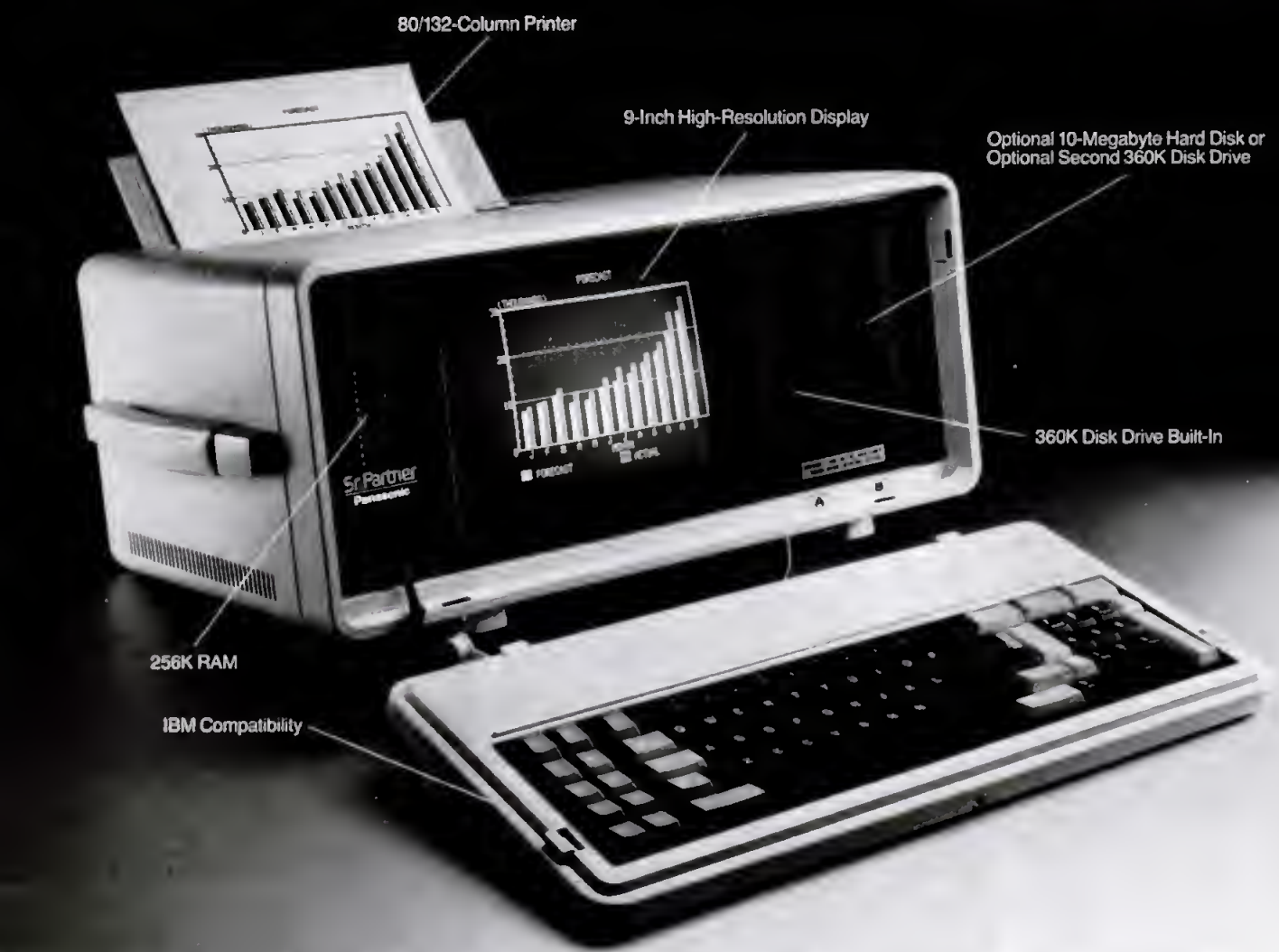

*Software bundle offer subject to change or withdrawal at any time without notice. **One-year limited warranty, 6 months on thermal printer head. Carry-in or mail-in service.
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CIRCLE 177 ON READER SERVICE CARD

Training on a Chip

Today the training environment and the work environment are becoming one. With embedded training and job aids, you learn how to do your job from a chip in your machine.

Embedded training is a new name for an old concept: on-the-job training.

Industrial designers are now embedding training, via the ubiquitous chip, into machines people use to do their jobs—from computers to X-ray machines to tractors. The chip is programmed to teach you how to use a device and gives you easy ways to get help when you run into trouble. Diagnostic routines pinpoint the exact sources of trouble in case of a malfunction. Instructional routines can tell the repairperson or even the user exactly what to do. Training that once took lots of time and skilled people now takes little time and even less skill.

Remember what training was like B.C.—Before the Chip? If you wanted to become a typist, machine operator, or credit analyst, for example, you attended a school or training program. You usually learned much that you would never use on the job. You didn't learn certain things that you did need, but eventually discovered these things on your own or from fellow workers.

This system worked as long as people went on doing the same thing year after year. But today the pace of job change has accelerated. You can no longer use the same skills year after year. The old ways no longer work. Embedded training has turned out to be the solution.

Not limited to routine clerical jobs, embedded training can also work with jobs that require high levels of problem-solving and decision-making skills. For example, a bank employee who must make a credit recommendation based on all the information he or she can gather about an applicant's credit status is now prompted on a computer screen with the proper questions to ask. The information is analyzed as soon as it is entered, and the next bit of data that is required is called for on the screen. Except in special cases, by the time all the data are entered, the decision to grant or withhold credit should be nearly automatic.

Norman D. Kurland

Embedded job aids are making jobs easier, increasing worker productivity, and reducing errors. Used wisely, they can also expand the scope of demanding but not very challenging or creative jobs. On the other hand, embedded training could make some jobs more routine and undemanding. Someone who formerly needed exacting skills may now need only follow instructions.

A Question of Cost

Of course, nothing inherent in embedded job aids requires designers to use them to reduce the quality and value of the human contribution. However, if the cost of producing and using a job aid is less than the cost of training and employing a more highly skilled worker, firms may be tempted to choose the aid rather than the skilled worker. In doing so they may lose the human qualities that no aid can replace—adaptability, creativity, flexibility, and willingness to make the extra effort—often the keys to greater productivity. The challenge in job design is to use embedded training and job aids as tools *for* people, rather than *instead* of people. ■

Norman D. Kurland is a consultant in education and telecommunications. He is currently doing a study of the ways in which technology is changing the education and training of workers.

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Letters to PC

Version Number Problems

I read Alfred Poor's review of the *Crosstalk XVI* communications program with interest ("Take Your Choice: Two Communications Packages," *PC*, Volume 3 Number 12). I am glad to see a commercially available program that has, at least as an option, a file transfer protocol compatible with other communications programs. I am, of course, referring to the XMODEM protocol, which has become the de facto standard among users of the various public-domain computer bulletin boards.

I did have a slight problem purchasing a copy of *Crosstalk XVI* that would use the XMODEM protocol. After contacting Microstuf, I found out that only Version 3.4 and subsequent versions have XMODEM capabilities. Poor's article did not mention which version he reviewed, and apparently some stores are still selling older versions. Since there are considerable expenses and inconveniences incurred when getting an update of a software package (software updates are generally sent to registered users at no cost, but you must pay for an updated manual), you should warn your readers to check the version number of the program they are buying. As a computer consultant, I recommend that my clients try to obtain the latest version of any software they purchase. And I always suggest they get this information from a source other than the store where the purchase will be made.

John F. Belsher
Placentia, California

More Words on Word Processing

Thank you very much for the word processing summary ("The Word on Word Processors," *PC*, Volume 3 Number 17). It was easy to read and very well done, considering the problems you have discussed regarding putting an issue to bed. The article particularly came in handy for a course on word processing that I am preparing to teach.

There is one critique I'd like to make. I use *WordStar* extensively, and I felt that your screen shot for *WordStar* did that excellent program a disservice. For the

other programs you showed a tight screen display with all bells and whistles visible. But for *WordStar* you double-spaced the text and left off most of the editing aids, such as the ruler line. The result was terrible and did not do the program justice.

Thomas E. Simondi
Los Angeles, California

Your review of word processing programs was the best comprehensive review I have ever seen. There were many features that our legal department would have liked to have seen included. For example, if a computer has two different printers attached to it, can the program send to one or the other without reconfiguring? Can the program automatically renumber paragraphs? Does the program highlight before and after the text is entered? Another important feature of the program is the helpfulness of the manufacturer to the end user; does it have a toll-free number?

PC Magazine is the best magazine of its kind, and I am eagerly awaiting for the start of my subscription.

Jeffrey A. Smoley
Miami, Florida

One of the most valuable features of *MultiMate* is its ability to edit other documents while printing. In the article "The Word on Word Processors," the chart on page 141 claims that this can't be done.

This is true only if the Foreground mode (F) is selected on the print-document screen. If the Background mode (B) is selected, *MultiMate* will enable editing of other documents. *MultiMate* also provides a queue for documents waiting to be printed and an option to delay a document until a specified time —even a future day—just as long as the program keeps going.

Todd Lindberg
Scottsdale, Arizona

Krasnoff Kudos and Criticism

Bravo to Barbara Krasnoff! Not only has she uplifted *PC* with an unusual and nonpompous editorial ("Consumer Guinea Pigs," *PC*, Volume 3 Number 17), but in the same issue she also introduced a useful format for comparing application programs ("The Word on Word Processors"). I even think that her editorial understated how widespread the practice is of dumping the costs of software development onto the user.

Regarding the word processor comparisons, I think that allowing so many reviewers such wide latitude leads to some erroneous conclusions owing to their unequal criteria. For example, the chart shows that Microsoft's *Word* hyphenates, while *XyWrite* does not. My copy of *XyWrite* does indeed hyphenate, using - and -, in much the same way that

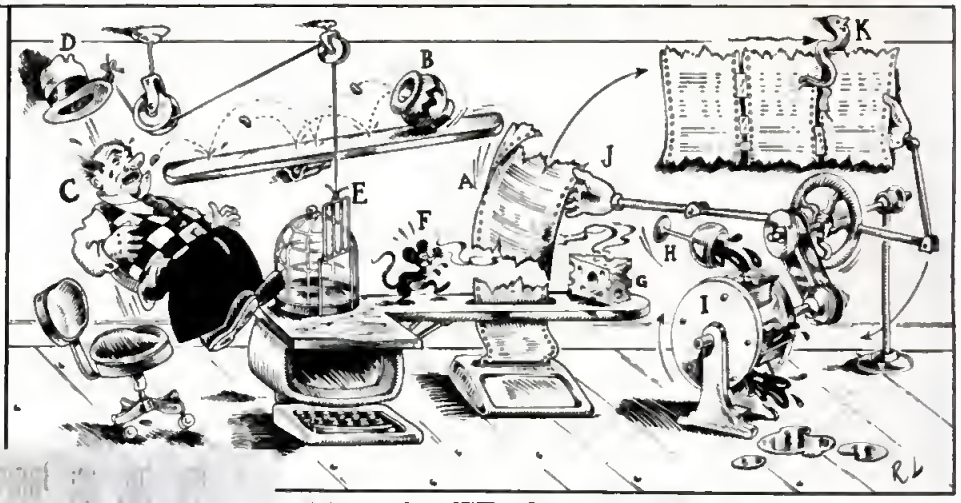
SIMPLIFIED SPREADSHEET ASSEMBLY

RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBOBULATED THAT HIS HAIR STANDS ON END, DISLODGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G)

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).



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The experts agree. *PC* Magazine, for example, writes: "If you've got the need, Sideways has the solution." And *PC World* calls Sideways "nifty . . . . an easy to use program that does what it claims."

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Word does, though *Word* uses different characters. I guess this error is a product of the reviewer's passions, and word processors do stir passions.

Again, kudos to Krasnoff.

Robert L. Woods
Claremont, California

I picked up the September 4 issue of *PC* from the newsstand to read the word processor comparison, and I noticed Barbara Krasnoff's article "Consumer Guinea Pigs." She deserves a raise—to identify a problem is one thing, but to be honest and print it is another thing. I admired her article—she is correct, and I am grateful to *PC* for running it.

Darrell F. Bennett
San Luis Obispo, California

"Consumer Guinea Pigs," by Barbara Krasnoff, had many points that were well taken, but a few that were misguided. Her thesis is that software publishers are wrong to let the consumer or magazine reviewers debug its packages. Like Krasnoff, I recognize that publishers cannot find all the bugs before the first package leaves the production line. However, she also states that the producers do not have the courtesy of receiving prepublication copies of the product reviews. That viewpoint represents the same philosophy she attributes to the software companies themselves.

Product reviewers have been given special privileges for the mutual benefit of both the magazine and the manufacturer. One needs copy to fill in the spaces between the paid advertisements; the other needs published critiques to increase consumer interest. This is fine. But to hold back, for any length of time, any information that would provide product improvement for the end user, in the name of writer integrity, is a sign of false superiority.

I totally agree that reviewers should not submit copy to the manufacturer for editing, but they should submit copy if it will result in quicker action from the manufacturer. The time between when an article is written and when it is published, by your own admission, can be months. If you would provide the manufacturer with a prepublication copy of a review, you could speed up future enhancements to products by that same period of time. The only question of integrity is that of conflict of interest on the reviewer's part. Unfortunately, Krasnoff comes close to the line when she suggests that a suitable response to being asked by the manufacturer for a prepublication copy of the review would be "What will you pay me for the service?"

In summary, we all agree that a perfect program is what we want. None of us expects such a product early in its lifetime. The market pressure created by the manufacturers and the consumers will not allow that luxury.

Anything a reviewer can do to increase the value of the product to the reader and potential consumer is positive. Anything less is a disservice to the audience a magazine serves.

Bill Accola
Moscow, Idaho

I am writing in response to Barbara Krasnoff's sanctimonious editorial ("Consumer Guinea Pigs") about the software industry's practice of using the paying public to debug its products. I want to say flatly and unequivocally that we not only expect our customers to debug our software, but we expect them to help us design it as well. Those of us with many years of experience in the industry know that the best software is designed through a symbiotic relationship between the customer and the developer. I think you do your readers, especially those new to computers, a great disservice by leading them to believe that software is simply a product like toothpaste or toilet paper.

A customer has no more right to expect a perfect software product than he has to expect a perfect film or novel or symphony (no pun intended). What the customer can expect is service. He can expect that he has gotten the programmer's best effort and that it has been thoroughly tested. He can expect to be notified of any bugs and be sent the corrections. He can expect to have his questions answered and most of all he can expect to have the software developer take his problems seriously and design future software to solve these problems. Good software is a constantly evolving enterprise, and the customer has an essential role to play in the process.

We not only expect our customers to debug our software, but we expect them to help design it.

It is absolutely impossible to subject a complex piece of software to all the conditions that users will subject it to. Beta testing, while good in theory, is never adequate.

I do not find it unreasonable for a vendor to want the reviewer to help him improve his software. One would assume that a reviewer, particularly a paid reviewer, would be an especially knowledgeable user. Unfortunately, this is rarely the case. It is equally understandable that the vendor would like to check a review for accuracy as well. I have seen gross errors in reviews, both for and against products. Just a bit of editorial checking would have resulted in a far better review. I only wish that reviews were as error free as the software they discuss.

Victor Rosenberg
Ann Arbor, Michigan

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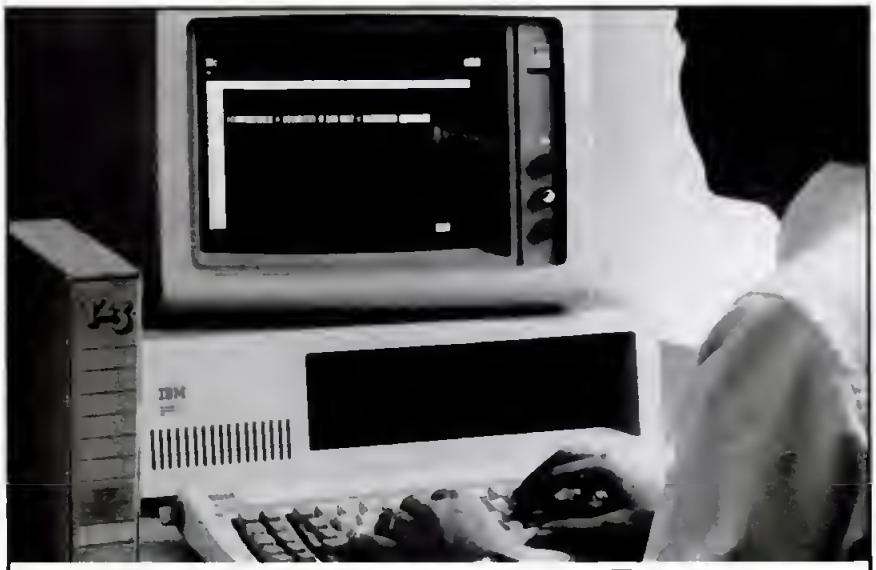

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LETTERS TO PC

card with a different screen? I have done some limited investigation myself, but I have not been able to determine whether or not this is true.

Also, is it true that it is possible to display alphanumerics on one screen while displaying graphical information on the other? If so, are there any special requirements?

R.M. Emberson, Jr.
Palo Alto, California

'Tis true! Many PC users have both types of display cards (with monitors) attached to their PCs, and at least one display card, the Paradise MultiDisplay, supports both types of screens. A simultaneous display of graphics and text is supported by Lotus's 1-2-3 *and* Symphony, *and other programs can do it too. Simultaneous displays of different text on each screen is also possible. Watch for an upcoming article in* PC *on how you can display data on both screens.—Ed.*

DisplayWrite 2 for Me

I enjoyed reading "IBM's Displaywriter Begets a Family of PC Software" (*PC*, Volume 3 Number 18). I have now decided that *DisplayWrite 2* is the word processing program for me. Just as soon as IBM sells all the printers it can to users who will buy a printer just to run the program and then releases the version that will work with my Diablo 630, I am going to buy it.

Alexander V. Pinter
Columbus, Georgia

Custom Tailoring Your Screen

I've just taken up reading *PC Magazine* again and have noticed some important improvements in the last few issues. Now I'm planning to stop my subscription to *PC World* and start one to *PC*.

I was prompted to write this letter after reading a letter from Benjamin Sasso, "Clocking the PC" (*PC*, Volume 3 Number 15, page 94), in which he responds to information on changing your prompt. *(continued)*

LETTERS TO PC

How you like your prompt and screen to appear is definitely a matter of personal preference. Since I don't like how the time shows up floating over in the corner in Sasso's example, I'd like to share my method with other readers.

On a color monitor, you have much more leeway to set apart your clock. I put the date and time on the first line and let the default drive prompt me below. To distinguish the prompt from the rest of the screen, I set the prompts to red on white, while the rest of the screen is white on blue. To get this, I enter:

```
PROMPT $e[s$e[H$e[31;47m$d -
$t $e[u$n$g$e[37;44m
```

Of course, the color commands don't work on a monochrome monitor, so I set my top line apart by putting dots out from my date and time display with the prompt:

```
PROMPT $e[s$e[H$d - $t.....
....$e[u$n$g
```

As Sasso's letter also said, you must have a "DEVICE=ANSI.SYS" line in your CONFIG.SYS file.

Fred Vinson
Washington, D.C.

As the Database Turns

I got a big kick out of the sample names of employees chosen for "Project: Database" (*PC*, Volume 3 Numbers 11–17).

My husband, who is not into computers but is an avid fan of "Days of Our Lives," was glad to find out that the magazine I spend so much time with has a sense of humor.

Kathleen Beckett
Tujunga, California

Are the editors at *PC* aware that their writers are watching the popular soap opera "Days of Our Lives?" I am referring to the employee names chosen to illustrate database functions in your recent series, "Project: Database." Now, I don't mean to be a snitch, but honestly—how can you expect PC users to take you guys

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LETTERS TO PC

seriously if your staff is huddled around the old tube watching soaps in the afternoon?

Oh, by the way, does anyone at *PC* know whatever happened to David Banning? I missed that episode.

Maya Bohnhoff
Grass Valley, California

The employees' names for the database project were taken from an example given in one of the database packages that wasn't reviewed. As for David Banning, why, he's here working at PC.*—Ed.*

Where Are They Now?

I would like to locate the manufacturer of the Keyport 300, the touch tablet that was described in PC News ("Keypads as Much Fun as Compatibles at CES," *PC*, Volume 3 Number 15, page 49). Thank you for your help.

Frank J. Mihm
Aptos, California

The manufacturer of the Keyport 300 is Polytel Computer Product Corporation, and its address is 1250 Oakmead Pkwy., Suite 310, Sunnyvale, CA 94086, (800) 331-4411, (408) 730-1347.—Ed.

Correction:

The telephone number of Beaman Porter, Inc., was printed incorrectly in the review of its *PowerText* software ("Creative Formats for Creative Writers," *PC*, Volume 3 Number 18). The correct number is (914) 967-3504.

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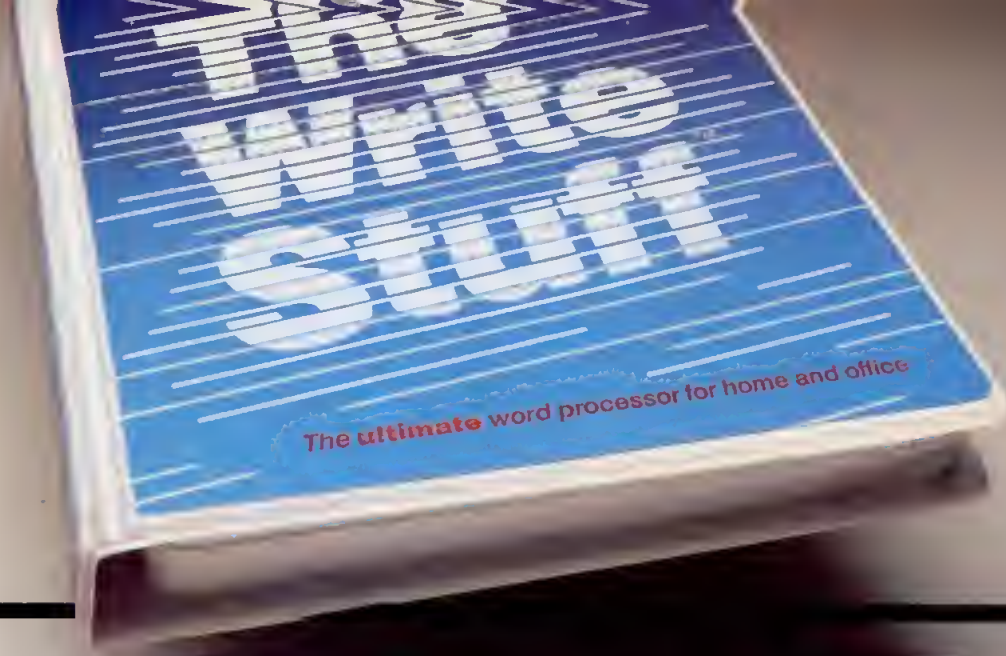

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The TopView Phenomenon

IBM's forthcoming TopView windowing system is more than it first seems. It can accommodate almost any program, is an efficient and lightning-quick performer, and has a great user interface.

It's hard not to get excited about *TopView*.

As you've read in the PC News section of *PC*, when IBM announced its latest set of PC-family goodies, among the items was a high-powered windowing system called *TopView*.

TopView, I regret to say, won't be available to the public until next year. A few hundred lucky software developers were given preliminary copies of *TopView* to begin working with. In addition, I can now reveal that months before *TopView's* announcement, a small handful of outsiders—myself included—were brought into IBM's Boca Raton inner sanctum to experiment with and comment on *TopView*. Accordingly, I can give you a report on *TopView* based on months of hands-on experience.

What is *TopView?* It's a lot more than it appears to be. At first, *TopView* seems to be a simple windowing system, a system that lets you have more than one program active at a time and switch from one to another with ease. If we give each program a separate part of our display screen to use, we've divided the screen into "windows"; that's where the term *windowing system* comes from.

This year, it seems as though dozens of windowing systems are being developed for the PC. Some use the graphics-oriented "Star technology" introduced in the Xerox Star computer and made famous in Apple's Lisa and Macintosh. The best-known such windowing system for the PC is Microsoft's *MS-Windows* software. While I believe Star technology is truly the wave of the future, I don't think its time has come for the IBM PC world. For one thing, about two out of three PCs use the monochrome display, and systems like *MS-Windows* require a graphics adapter.

Peter Norton

Unlike its competition, *TopView* really has what it takes to work with the millions of PCs in use today. What sets *TopView* apart is that it can work with just about any PC and any software out there. As a character-based (and not a graphics-based, or Star-type) system, *TopView* can work with either monochrome or graphics-equipped PCs.

The Welcome Mat

Even more importantly, *TopView* is extraordinarily good at accommodating programs and making them work well in the *TopView* environment. That isn't easy. Many unruly programs are difficult for a windowing system to tame. A program can do all sorts of things to make life difficult for any system to operate more than one program at a time. The most famous and widespread kind of unruliness is writing output directly into the display screen's memory (instead of using IBM's approved methods for creating display output). But many other kinds of unruliness exist, including changing interrupt vectors, fiddling with the keyboard, and a lot more.

Extraordinarily enough, *TopView* manages to tame almost all programs. Every single application program that I use runs under *TopView* with no difficulty. While the whole point of a windowing system is to let us simultaneously run the programs that we want, oddly enough, many windowing systems will work only with programs that have been custom-tailored for them. Those systems make *TopView* look very good indeed.

What's the point of using a system like *TopView* that can run several programs

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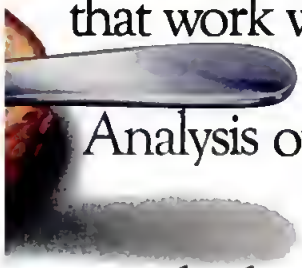

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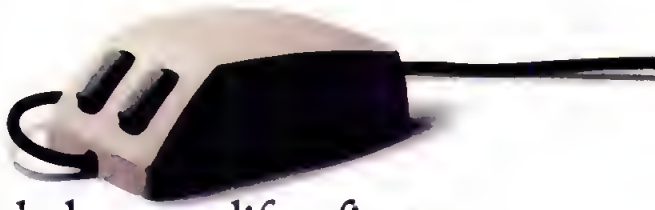

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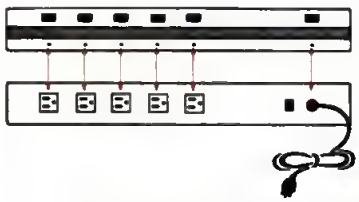

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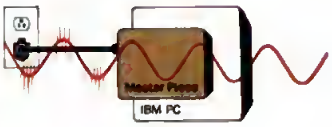

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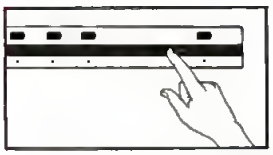

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CIRCLE 275 ON READER SERVICE CARD

simultaneously? I can see three reasons. First, when we run programs that don't need our attention to get their work done (such as programs that generate printed reports, or compilers), we don't have to tie up the computer. Without a system like *TopView*, if we're running a database report, our computer is completely tied up doing that one thing. With *TopView*, we can get on with some other task while the report is working away in the background.

A second reason for running programs concurrently is simply to have them on standby. At times, you'd like to put the work you're doing on hold, switch to something else for a moment, and then switch back. In the usual computer environment, switching back and forth means going through the annoying steps of starting up and shutting down your programs. But with a system like *TopView*, you can leave as many programs as you like on hold, ready and waiting for you to use them.

The third reason for running programs simultaneously is integration. People use *1-2-3* and its competitors so they can combine word processing with a spreadsheet and other functions. But to use a program like *1-2-3* or *Framework*, you have to adapt to its style of work. What if you would like to combine, say, *WordStar* with *VisiCalc? TopView*, in effect, lets you put together a loosely integrated package out of your own choice of parts. Choose your favorite word processor, spreadsheet, programming language, and so on and make them all work together. Of course, with *TopView* you don't get tight integration, but you can combine pieces and share data through *TopView's* ability to "cut" data from one program and "paste" it into another.

Great Performance

Now, do all these features work well in *TopView?* You bet. To test *TopView*, I created some exercises. One was a performance monitor that measured just how efficiently *TopView* could run multiple programs. I was amazed (so was IBM when I reported the results—the company hadn't had a chance to create its own performance monitor). I found that, under normal circumstances, *TopView* has practically no overhead, leaving all the computer's horsepower for our programs. Even with ten programs running—which requires a lot of supervision from *TopView*—only about 15 to 20 percent of the computer's power went to overhead. On a PC AT, the overhead would be more like 2 percent.

The most mind-blowing test I did of *TopView* was a window-moving exercise. I set up a display in which *TopView* has three overlapping windows on the screen: three rectangles of information, the first on top of the second, the second on top of the third. Then, using *TopView* commands, I start moving the middle window around the screen using a mouse for quick movements. Now, when I move this middle window, it has to disappear behind the top window and also cover over the bottom window. Then I start whipping the mouse around, so that my middle window is racing wildly around the screen. *TopView* has to do lots of work to figure out where I've moved the mouse, calculate where the middle window should be (including all the information inside that window), and also calculate which parts of the three windows should be covered up or not.

> TopView has little overhead, leaving all the computer's horsepower for our programs.

While all this is going on—and I'm moving the mouse very fast—the screen display is keeping up with my movements easily.

That's not the half of it. What I've told you about *TopView* are things you will see for yourself when you use *TopView* with ordinary programs. The most amazing part of *TopView*—the part that repeatedly astonished me each time—is the special facilities that it has for programs written specifically to run under it.

User Interface

TopView has an amazing user interface that includes windows, panel areas on the screen, keyboard control, cursor control, mouse control, list scrolling, item selection, multiple-field data input with prompting, and more. It's an absolutely astonishing array of sophisticated program support that I could hardly begin to describe.

TopView's user interface is one of the most fantastic things I've ever seen, and it's all on tap for any program that wants to use it. It will have very far reaching effects, once people latch onto it.

Stop and think about it. Most programs we use have rather poor user interfaces—inferior ways of handling keyboard input and screen output—simply because writing a first-rate user interface is a huge task, one that only a Lotus Development Corporation or a Microsoft could really undertake. Time and money constraints have forced many "small" (but useful) programs to make do with rather crude interfaces.

Now, for anyone who wants to take advantage of the *TopView* interface, a ready-to-use set of facilities is available that makes the old state of the art look modest by comparison. Someone at Lotus Development Corporation put it to me this way: before *TopView* appeared on the scene, *1-2-3* had impressed a lot of people with its user interface. Now, with *TopView*, anybody's programs can look better than *1-2-3*.

This interface is what makes *TopView* a "sleeper." It's going to take a while before people understand what *TopView* can really do. But when they wake up to it, and the *TopView* bandwagon gets rolling, we're gonna see some incredible stuff. ■

You can't buy an IBM® PC with

Here are five important measurements to help you make the best choice:

IBM forces you to choose:

Buy a monochrome card and monitor for high-resolution text. (Essential for word processing and spreadsheets.)

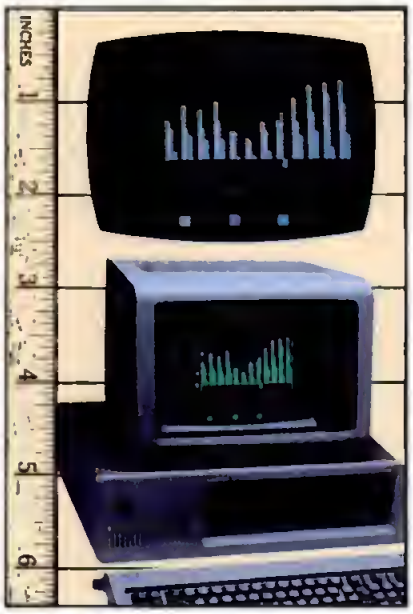
Or buy a color card and color monitor for graphics. (Lotus™ 1-2-3,™ for example, uses lots of graphics, as well as text.)

You can invest in both; you can sacrifice one or the other; you can settle for a non-standard compromise.

Or you can buy Paradise.

Here's how we've measurably eased your job of choosing the best video display (saving you a lot of money in the process).

1. Measure video functions.



The Paradise Modular Graphics Card™ gives you *full screen, 16-shade* graphics on *any* display, including IBM's high-resolution monochrome monitor.

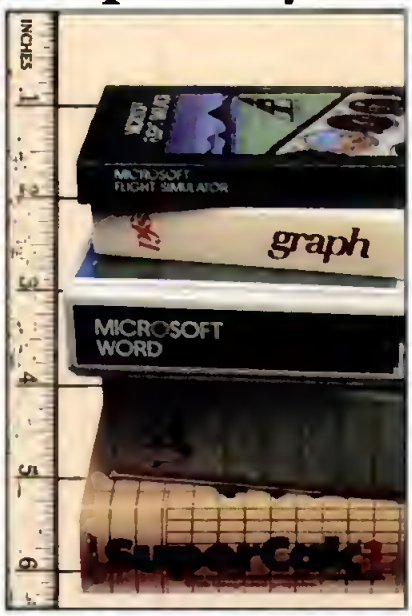
IBM's color/graphics card can display 16 colors on a color monitor.

So can the Paradise Modular Graphics Card.

But that's where the similarity ends. When you use color/graphics software with the Paradise Modular Graphics Card and a monochrome monitor, it translates those colors into a true 16-shade gray scale. With full screen display, flicker-free scrolling and clear, crisp character sets (like those of IBM) in all modes.

Naturally, the best video card fits either the IBM PC or XT, and works with any monitor you choose: IBM monochrome (or equivalent), RGB or composite video.

2. Measure software compatibility.



Many video cards only work with specially modified software. The Paradise Modular Graphics Card runs popular off-the-shelf color/graphics software on your choice of monitors. *Unmodified.*

Most cards that offer graphics on a monochrome monitor force you to sacrifice off-the-shelf software compatibility.

Paradise doesn't want you to compromise.

Of course the Paradise Modular Graphics Card runs Lotus 1-2-3 graphics on an IBM monochrome monitor.

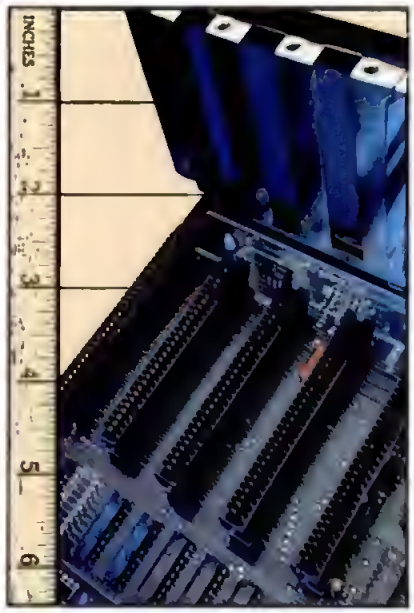
But it also runs almost all unmodified off-the-shelf color/graphics software.

Like PFS®:GRAPH, SuperCalc,®3 Flight Simulator® and Symphony.™

No wires. No tricks.

A menu-driven software system—with a user interface much like that of Lotus 1-2-3—lets you take advantage of all the Paradise Modular Graphics Card's features.

3. Measure slot utilization.



Unlike other video cards, the Paradise Modular Graphics Card gives you *additional popular functions in a single slot.* This may be the only card you'll ever need.

You need to worry about slots for future expansion. Since you *must* use

out choosing a video card.

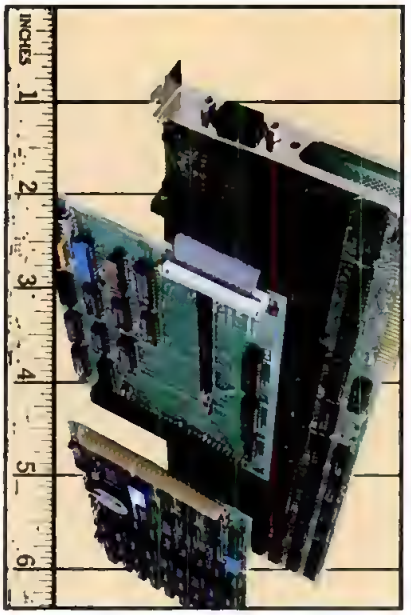
a slot for video support, why not pack it with more functions?

The Paradise Modular Graphics Card puts color and monochrome video support *plus* your choice of the most commonly requested enhancements into one slot.

Enhancements like extra memory, clock calendar, floppy disk controller, parallel, serial or game ports.

Leaving you measurably more room to expand.

4. Measure cost efficiency.



Unlike other multifunction cards, the Paradise Modular Graphics Card lets you choose the options you need, now or later.

You select the features you *want*, when you want them—no more, no less. So you pay only for what you need.

Choose one module from list A, one from list B, or one from each list. The Paradise Modular Graphics Card fits in a single PC or XT slot, even with both modules attached. And without imposing on adjacent slots.

5. Measure value.

Value: the ratio of performance to price. No matter how you configure the Paradise Modular Graphics Card, you get more performance for your money, and more performance for your slot.

You'd have to combine several other cards to even approach the Paradise Modular Graphics Card's functionality.

Obviously, that would take up several slots in your PC.

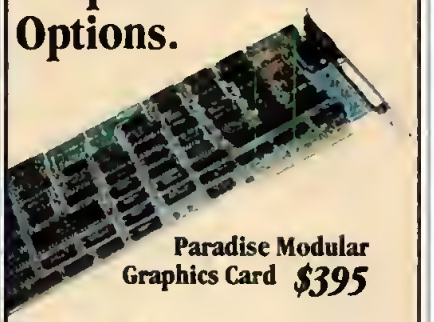
It would also cost you a lot more money.

And if you review measurements one through four in this ad, you'll realize that no other card—or combination of cards—can give you better PC performance.

What about reliability?

Guaranteed by a one year warranty.

Paradise Modular Graphics Card and Options.



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Addressing:
16K video memory starting at B8000H

Software included:
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A Module Options:

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Welcome
to
TopView
Press 1 to use the TopView Tutorial
Press ↵ to continue
IBM

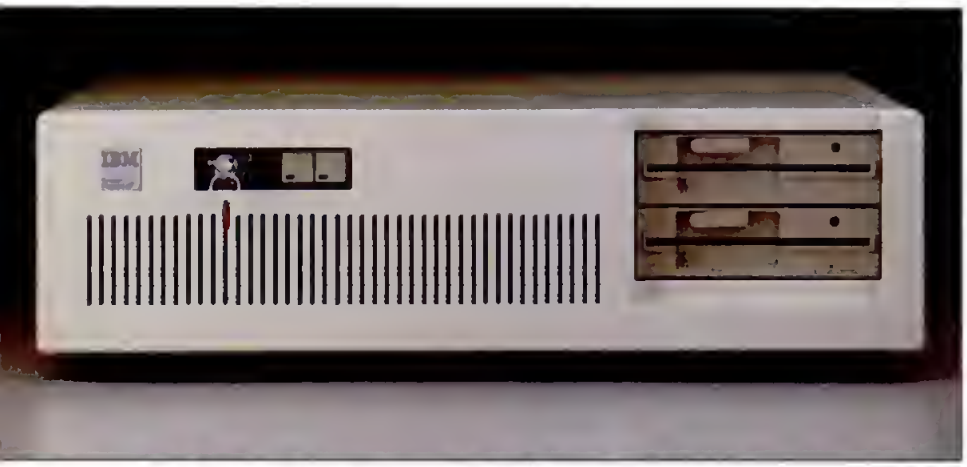
COVER STORY • PAUL SOMERSON

IBM BRINGS OUT THE BIG GUNS

IBM's dazzling new AT gives m[illegible] awesome speed and power and [illegible] compatibles industry on its ear. [illegible] marvel is unquestionably the n[illegible]

Photograph: Slag Ikeda

The PC AT is IBM's first real microcomputer. When IBM introduced the original PC in 1981, it was just testing the market; the PC-1 came with a paltry 16K of on-board RAM, a cassette port, and a BASIC ROM that couldn't divide by 10. But the overall design was decent enough to let the IBM marketing steamroller flatten the competition. The PC-2 and PC-XT were minor variations, not wholesale re-engineerings.



The PC AT as viewed from the front. The window adjacent to the nameplate contains a keylock, as well as a power-on indicator light and an LED for the internal 20-megabyte fixed disk. The upper floppy drive (at right) is for new high-density disks. The lower drive space is for an optional 360K floppy drive (as shown) or for an additional 20-megabyte fixed disk. The primary fixed disk is located in the center of the machine behind the ventilation grille.

In late 1983, however, despite persistent rumors that IBM was on the verge of announcing a breakthrough multitasking machine, increasing numbers of competitors began nipping at the PC's heels by offering computers with faster clocks and more powerful CPU chips. Once-invincible IBM had stumbled badly with the hapless PC*jr*, and the company's subsequent PC Portable was universally panned as an overpriced Compaq imitation.

Sales of IBM PCs and PC-XTs had begun to slow, prompting some myopic analysts to suggest that IBM was out of touch with the micro-hungry customer, technologically addled, and about to slide from the top of the heap. Of course, many of these critics were the same pigeons who extolled various Apple playthings as serious business computers. But the market was clearly not all IBM's. Tandy was flogging its uncharacteristically business-like 2000. Compaq took the handle off its luggable, revved up the clock, and trumpeted its pricey DeskPros as IBM-busters. AT&T yanked a creditable Italian workstation through customs and into the stores. Bit players from Eagle to Sperry watched IBM take its knocks and introduced me-too machines of their own. Then IBM dropped the bomb.

Although in the past IBM usually met such micro challenges through displays of marketing muscle rather than high-tech prowess, this time it has responded by cobbling together a truly awesome computer at a very aggressive price. Many observers feel IBM could have charged $1,000 to $2,000 more and not lost too many sales. And IBM isn't in the charity business. The $4,000 to $5,700 sticker was clearly meant to knock the competition out of orbit. It also signaled an imminent price reduction in IBM's other, now-overpriced micro hardware. Grim competitors may dismiss the AT as just a supercharged PC-XT, but it's a safe bet that its lowball price tag and the downward push it exerts on prices of lesser machines mean the hands that hold the reins at compatibles manufacturers may soon be reaching for the local want-ad sections.

IBM PC AT
IBM Entry Systems Division
P.O. Box 1328
Boca Raton, FL 33432
(800) 426-3333
List Price: $3,995 with 256K RAM, 1.2 megabyte floppy disk drive; $5,795 with 512K RAM, 1.2-megabyte floppy disk drive, 20-megabyte fixed disk, serial/parallel adapter.

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New Features Galore

IBM is offering the AT in two configurations—stripped or stuffed. Both are

based on the same IBM model 5170 chassis, housing a 6-MHz Intel 80286 chip, eight expansion slots (six of which are socketed for 16-bit addressing), a built-in battery-operated clock and calendar, 256K of on-board RAM, a power supply half again as large as the PC-XT's and three times the size of the PC's, a temperature-sensitive variable-speed fan, a new "high-capacity" floppy that holds 1.2 megabytes of data, a new single disk controller that can handle this new quad-density drive as well as IBM's new larger fixed disk *and* the conventional 160/180/320/360K floppy, and such incidentals as a power on/off light and a key that locks the cover and prevents unauthorized use.

The Enhanced model tosses in another 256K of RAM (for a total half-megabyte), a serial/parallel I/O adapter on a shared printed circuit card, and an internal 20-megabyte hard disk with a lickety-split 40-millisecond average access time. Neither model comes with a display card or a monitor, which adds another $600 to $900 to the unit price and is especially disappointing to those users who were hoping for a new, high-resolution color graphics adapter and screen.

International Power

The power supply on both models is switchable for American or European wiring, and a new set of DOS 3.0 utilities reconfigures the keyboard for British, French, Italian, German, or Spanish operation. (DOS 3.0 is required to handle the large AT high-capacity floppy and hard disks, although the computer will boot and run most earlier versions so long as the disks don't use exotic timing or track-formatting copy-protection schemes. Apart from a smattering of code fixes and new utilities, DOS and BASIC 3.0 are nothing new and do *not* replace DOS 2.1 on earlier machines. DOS 3.1, expected in the fall, will be identical to 3.0 except that it will support the new IBM network.)

While the PC keyboard generated a remarkable amount of user venom, the AT keyboard is unassailable. IBM obviously listened to the many complaints but retained the sculpted, sloping look, the dished keys, the crisp, slightly off-center touch, and the tactile and auditory feedback that make all the imitators just pallid, plastic toys.

The AT keyboard now resembles that of a stretched Selectric, complete with an oversized, J-shaped Enter key, and fat shift keys in their familiar spots without any intervening potential pinky problems. For those with errant fingers and short memories, IBM slapped on green LEDs to indicate the states of the NumLock, CapsLock, and ScrollLock keys. Even the small trouble spots have been properly attended to. The Esc key, which could cancel a line in BASIC or DOS if erroneously struck when you were reaching for the Tab, 1, or F2 keys, has now been banished to the cursor pad along with the PrtSc, which was too easy to hit in combination with the shift, hanging the computer if the printer was off-line. And the tilde/grave key that was the bane of tyros

The PC AT as viewed from the back. IBM supplies a standard removable plastic panel to dress up the appearance of the system unit. Note the eight expansion slots. One must contain the disk controller card, and one the monitor driver. An additional serial/parallel card is standard on the enhanced model.

Photographs: Les Morsillo

For the AT Only—A Great New Keyboard

The AT's keyboard is an improved version of the PC's with the good points retained and the irritating ones corrected. But it only works with the AT.

At first glance the PC AT's keyboard doesn't seem much different from the PC's. When you take a closer look, you'll find most of the changes are subtle, but they are all important—and long overdue.

The AT's is still the same keyboard with that now-familiar clicking sound and white/gray color scheme.

Enter, Shift, Space

The Enter key, shift keys, and space bar are most altered. The space bar now has extra room around the outer edges, separating it from the Alt and Caps Lock keys. The shift keys are wider and are now contoured and labeled. Even the Enter key is labeled. The arrows remain on those keys, but the labels are welcome additions.

The Enter key now has a different shape, strongly resembling that of a typewriter Return key. It will be hard to miss the "target" from now on when entering data. The shift keys slope upward and outward—comfortable to the touch and a breeze to use. As does the new Enter key, the shift keys leave you plenty of room to hit your mark, a change that will certainly cut down on errors.

IBM has not labeled the Tab or Backspace keys—they still only have arrows on them. The Tab key is wider, while the Backspace key is narrower and has been moved to the right slightly (above the Enter key).

It's hard to miss the row of three green LED indicator lights on the upper right-hand side of the keyboard. They show when the CapsLock, NumLock, and ScrollLock keys are activated.

This arrangement is better than that on Key Tronic's enhanced PC keyboard, which has red LED indicator lights on the keys themselves. Placing the lights high on the keyboard makes it easy to see which keys are on without lifting your fingers.

Moved Keys

The sometimes troublesome Esc key has been moved to a relatively harmless position at the top left-hand side of the numeric keypad above the Home key. Anyone who has ever tapped the Esc key instead of the Tab or 1 key will appreciate this change.

The Backspace key, although it hasn't been moved far, could be a problem on the AT because of its small size. The combination of the shrinkage and the move could cause you to tap the Pipe symbol key instead.

Two typing keys have been moved to

The PC AT's keyboard is substantially different from its predecessors. Note the enlarged Enter and Shift keys, the segregation of the number/cursor pad from the main typewriter keys, and the general Selectric appearance. The three squares above the pencil ledge contain indicator lights for the CapsLock, NumLock, and ScrollLock keys.

new locations on the new keyboard. One won't make much difference, but the other one will. The tilde (~) key has been moved to make way for the larger Enter key. It won't be missed by most PC users in its new position where the Esc key used to be.

The shift of the Pipe symbol key (| and \) will be noticeable. Since the backslash is used extensively in DOS path names, it will take some time for those who work with hard disks to get used to its new position near the smaller Backspace key.

Numeric Keypad

The function keys are untouched. The numeric keypad is now distinctly separate from the typing area, with no overlapping Ins key. Ins has been moved completely into the keypad. Its top is contoured like most of the larger keys, while the Del key has been shrunk.

This new arrangement for Ins and Del will delight *WordStar* users, because the two are more easily distinguishable. The changes in the Ins key will reduce your likelihood of tapping the CapsLock key instead.

The numeric keypad also sports such improvements as a shorter plus sign key. The minus sign key is the same size, but it has moved down slightly to make room for the newly positioned PrtSc key, which is now just above it. Just above PrtSc is the newest key, SysReq, which will be used in networking.

The NumLock and ScrollLock keys still rest at the top of the numeric keypad, but they are now smaller (the same size as most other keys on the keyboard). Each key has been moved inward: NumLock is now over the 8 key and ScrollLock over the 9 key.

IBM must have heard the complaints from PC users about the PC's not-quite-long-enough 6-foot cord, because the cord to the AT's keyboard is 10 feet long—a marvelous (and badly needed) touch.

The keyboard is basically the same size, although it's a bit deeper at the top. The changes have made it cleaner looking and less cluttered.

All the improvements were needed; you'll find you have fewer problems since most of the nuisances and irritations are gone. Sadly, this keyboard is only for the AT: It will not work with the PC or XT.

In inches, this keyboard's dimensions are: width, 18.4; depth, 8.3; height, 1.5, and it weighs in at 6 pounds.

Of course there will be those who, as always "want more;" and such improvements as an LED indicator for the Ins key, function keys across the keyboard's top, and perhaps a separate cursor movement keypad (like on the Texas Instruments personal computer) will be valid items on the PC AT wish list.

That wish list and slight adjustments to be made are more than compensated for by all of the PC AT's slick improvements and welcomed refinements.

If you do get an AT, you may need time to get used to it. But for the most part, the new keyboard will prove to be an effortless link to the new AT technology. —**Bil. Alvernaz**

"While the new key layout makes sense and defuses many of the tired old complaints, it isn't perfect."

The complete AT system, with the IBM RGB monitor and Borland's *SideKick* software package. The PC AT runs most existing PC software, except for programs using tricky copy protection schemes or making nonstandard DOS-type calls.

trying to enter a line is up out of danger above the Tab key.

The keyboard is divided into three tidy sections. Instead of the relatively unruly arrangement to the right of the PC and PC-XT Enter keys, the AT sports the same kind of metal dividing strip that ropes off the function keys. The new cursor pad is far more geometric and orderly than its predecessor and contains a new, 84th key—SysReq. SysReq currently does about as much by itself as ScrollLock, however, it may become popular if and when users ever start chaining their systems together.

While the new key layout makes sense and defuses many of the tired old complaints, it isn't perfect. IBM truncated the Backspace key to wedge many of the old offending keys and the new SysReq key into the upper right-hand corner. While the cursor-right keytop has no real estate to its east on the PC and PC-XT, the gray minus sign hunches to its right on the AT, which often results in a row of dashes when an ex-PC user distractedly tries to tap the cursor rightward. Similarly, the PC/PC-XT Del keytop hugs the bottom right-hand spot, while this honor goes to the gray plus sign key on the AT, resulting in failed erasures for the ex-PC crowd. But the worst move of all is probably burying the small, new AT Scroll Lock key between the NumLock and SysReq keys. When programs began spinning out of control on a PC or PC-XT, you could hold down the Ctrl key and punch the keyboard in the upper right-hand corner to bring everything to a halt. This move doesn't do anything on the AT except numb your fingertip.

The keyboard is deeper than the PC's and PC-XT's and trails a 10-foot-long cord coiled in the middle. But don't expect to plug one into any pre-AT machine; the AT keyboard has a bidirectional serial interface that only an AT can understand. And, since both the keyboard and the AT itself are deeper than their antecedents, much more space vanishes beneath the system. Rather than reduce the desktop footprint by cramming the contents into a teetering tower like the Macintosh, IBM is offering a "floor standing enclosure" that stashes the system unit out of sight. With so much hard disk space, there is almost no need to touch a floppy except when trying to run some crudely protected program that insists on having the original floppy in the A: slot.

Hard Disk Safeguards

Data security on virtually every other micro means locking your floppies in a desk drawer. The AT provides the first real system for allowing executives to sleep at night: a hard-to-duplicate "tubular" key locks all but keyholders out of the system. If the system is locked, an unauthorized operator can turn the power switch on and watch the initial diagnostic test, but nothing more. And once the computer is up and running, you can turn the key to the locked position and walk away without having to worry that someone will interrupt the action and make an illicit copy or file change. A locked, operating machine will not permit keystrokes to reach the buffer, effectively shutting out all intrusion. This lock will let you perform long sorts or spreadsheet recalculations without having to sit protectively in front of the screen.

Another potential hazard is theft or destruction of hard files. The AT allows you to store 40 million bytes of data. A

AT the Party

IBM throws a huge, folksy bash in Dallas to introduce the AT and bring its edgy dealers back into the fold.

For years IBM has staged immense, meticulously-planned motivation seminars and gatherings (reputed to resemble fervid revival meetings) for its own sales and management teams. But the face IBM has always shown to the public is one of stiff-backed, hidebound humorlessness.

On August 13th, the day before the formal AT introduction, IBM took off its dour mask and replaced it with a ten-gallon hat and a backslapping good-ole-boy grin. It invited between 1,800 and 2,000 nabobs from the nation's leading dealerships, as well as 200 software developers, to an expense-paid soiree in Dallas it called "Pride in Partnership." The event was ostensibly thrown to celebrate the third anniversary of the PC's release, to show off the AT, and to cement the somewhat testy relationship between IBM and one of its main channels of distribution.

While there really never has been any talk of open rebellion against the Big Blue Hand That Feeds, dealers were bristling at several recent IBM moves. These dealers were facing increased competition from scores of new dealers in their territories, including the newly price-conscious IBM product centers, and were barred from selling some of IBM's more interesting micro/mainframe merchandise. Many dealers had been stuck with PC*jr*s that they could barely even give away. And rumors floated about that IBM was about to axe all but the highest volume operations. To counter these sentiments, IBM executives—never before been seen in public without the IBM-trademark blue suit, white shirt, rep tie, black shoes outfit—

Mr. Philip D. Estridge
President, Entry Systems Division
Vice President
IBM Corporation

cordially invites you to attend a meeting
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at the Loews Anatole Hotel
Dallas, Texas
August 13-15, 1984

RSVP
1-800-IBM-2700

donned straw cowboy hats, IBM bandannas, and pointy-toed lizard boots, swallowed hard, and tried their best to become folksy backslappers. And, according to many of the spellbound guests, it worked.

The party was thrown at the Loews Anatole Hotel, the same one that would be used a week later by the Reagan-Bush folks. In fact, IBM executives in their cowboy mufti joked that the sinister-looking Ivy League types counting the house were actually advance men and security agents for the President and his extended party rather than prototypical IBM staffers.

The three-day event was, in the words of one participant, "a barrage of intensive behavior modification techniques from beginning to end . . . a constant psychological bombardment painstakingly choreographed to make the dealers

(continued)

> "The AT provides the first real system for allowing executives to sleep at night: a hard-to-duplicate 'tubular' key locks all but keyholders out of the system."

"IBM snapped nearly every one of the 2,000 plus guests, developed all the slides, and assembled them into a huge and flattering slide show—overnight."

(AT the Party continued)

feel that they were part of IBM and wanted more than anything else to be that way."

Everyone a Star

For instance, the opening party was a barbecue at which nothing but hard drinks were served and where the guests received their first dose of culture shock watching the improbably dressed IBM bigshots hobnobbing in their Western outfits. The next morning, after the guests streamed into the main hall to the strains of loud, disco-upbeat versions of the themes from *ET* (get it? ET/AT) and "Star Trek," the lights dimmed and enormous speakers began belting out a stirring rendition of *If My Friends Could See Me Now* as a montage of photographs was projected onto a series of gigantic screens at the front of the room. The photos were all of the partygoers of the previous night. IBM had snapped just about every one of the 2,000-plus guests in their silly hats and bandannas, developed all the slides, and assembled them into a huge and flattering slide show—overnight. The guests stared in awe and appreciation; they had become part of the IBM show, and by extension, part of IBM. The more astute realized as they saw the first faces flicker across the screens and heard scattered cries of recognition in the darkness that, from that moment on, the entire guest list was solidly in IBM's pocket.

Top IBM micro bosses Douglas LeGrand and Philip (Don) Estridge then whipped the spectators into a frenzy with stirring assurances that they were critical to IBM and that IBM was going to help them become successes. Guests later said that it was the single most motivating gospel show they had ever seen and that the euphoria lasted well after the jet ride back home.

Superstar magician Mark Wilson filled in the gaps in the show with his skilled illusions, introducing speakers and machines, making men and computers appear and disappear, which, according to participants, added to the special magic of the entire event. These IBM fellows don't miss a trick.

Throughout the three days IBM lavished gifts of all sizes on the dealers. The smallest were the Western garb and such other souvenirs as a fancy pen and rawhide notebook. The largest was an Enhanced AT at the special, one-time, rock-bottom dealer price of $2,500. Another was the announcement that payment due dates for PC*jr* hardware would be extended until the end of October; this magnanimous gesture brought a cheer from the assembled mass. IBM's aroused recital of its extensive upcoming advertising plans brought a standing ovation. IBM announced that its fall ads will be seen by 98 percent of the population at least once, and by most people at least five times. That's not chump change they're spending.

AT Bingo

This was only the beginning. If the guests weren't totally captivated by this point, IBM pulled out the remaining stops. It handed out Bingo cards to the already inflamed audience and instructed the players to shout out "PC AT!" rather than "Bingo!" when they completed the card. As the numbers rang out through the hall the tension mounted; everyone thought he was going to win an AT. After a few minutes the tension was barely endurable; every participant could see that he and the people around him were only one number away from winning. When the last number was called every single person in the room shouted out "PC AT!" at the top of his lungs.

This was followed by enthusiastic AT demonstrations, gourmet meals with

such touches as an ice carving in the shape of a computer, more exhortative speeches and impassioned pep talks, and more gifts. The Oak Ridge Boys performed one night and IBM gave all the guests the group's newest album—which was no mean feat considering the Boys claimed the album wasn't out yet and were mystified at how IBM obtained copies.

Guests Go Wild

By the end of the party the guests were in a wild frenzy of adulation of their hosts, and as the National Anthem was played over the speakers at the close of the event, one participant shouted that IBM could run the whole country in 10 years. Another guest yelled, "And they'll do a better job!"

The messages IBM sent were that the AT was the machine of the future; that *TopView*, its potentially impressive but crudely implemented windowing and multitasking software package, was going to assume critical importance; that IBM was going to back its dealers with immense advertising outlays; and that it was going to break through the barrier and manage to sell computers to legions of rubes at home by forcing them to "let go of their pasts." If IBM is half as successful with the population at large as it was with the party guests with whom *PC* spoke, there will be a computer bearing the IBM logo on every desk in the country by next year.

Love Letters

The simultaneous press announcement in New York was far more sedate, but equally persuasive. Virtually every bit of ensuing press coverage amounted to a love letter to IBM. The reason is clear—IBM has leapfrogged the competition after waiting for the right time to make its move.—**P.S.**

company's entire payroll, personnel, or R&D records could easily be stored on a hard disk. The AT key locks the cover onto the chassis, preventing casual thieves from unscrewing the case and walking out the door with such vital information. The key also ensures that a spiteful or clumsy operator can't erase all your files with just a few dangerous keystrokes. In addition, the hard disk mechanism can prevent data losses by positioning the heads over a "dedicated landing zone" when the system is moved.

Concerned PC-XT owners can buy themselves the same security by purchasing the $50 IBM PC Keylock Feature (#3177), which will clamp the cover down and prevent power-up unless a key is in the lock.

Rocket Ship Performance

The big difference most AT users will appreciate, at least initially, is speed. It is extremely frustrating to watch a PC grind a floppy for 10 or 20 seconds to read or write a long file. The XT's hard disk is a substantial improvement. But the AT's high-performance fixed disk is more than twice as fast as the XT's. And every other operation—even the initial power-on self-test (POST)—is far speedier.

Once loaded into memory, everything from BASIC programs to expensive applications software runs between two and three times more quickly on the AT than on any other IBM micro. There are several reasons for this speed. The AT clock ticks 25 percent faster than the PC's. The 80286 chip is designed to save steps during certain operations and can process data in bigger chunks. The overall system architecture is more efficient than the PC's or PC-XT's, and the AT can access memory faster. Even the AT's standard floppy is faster—it spins at 360 rpm compared to the PC's 300, and it has a higher data-transfer rate.

This speed is a delightful surprise for users accustomed to long delays, slow

"The big difference most AT users will appreciate is speed. Every operation, even the initial power-on self-test, is far speedier."

"The AT's high-density floppies add a whole new dimension to micro incompatibility, but they can store 600 pages of text on a single disk, making file portability from machine to machine far easier."

Double Your Pleasure, Double Your Fun

The PC AT offers twice the direct memory access and interrupt-driven processes of the original PC.

Two of the original PC's best design features are DMA (direct memory access) and interrupt-driven processes. The PC AT capitalizes on these features by having twice as many.

The DMA controller is a highly specialized microprocessor with the sole task of moving data around inside the computer's memory. Depending on how it is programmed, it moves chunks of data (up to 64K) from one area of memory to another, or it moves data from an I/O device, such as a disk controller, into memory. This dual process is the DMA's primary function in the PC.

DMA works most effectively in interrupt-driven systems. In such systems, the processor executes continually, never looking (polling) to see if any devices, such as keyboards or disk controllers, need attention. Instead, another specialized chip, the 8259A interrupt controller, monitors these devices. Moreover, it can be programmed to recognize some devices as having higher priority than others. Simultaneous requests for attention from, for example, the disk controller and the keyboard, are arbitrated without disturbing the CPU. The DMA controller also decides which processes are interruptible and which are not.

Once it has resolved such issues, the interrupt controller stops the CPU and forces its attention to the device requesting service. If the task requires a bunch of bytes to be moved from one place to another, the DMA controller usually does the job. And after the sector has been read or the character has been captured, the CPU picks up the previous task where it left off.

Interrupt channels are in short supply on the PC. Add-on boards, such as network cards, serial expansion ports, and tape controllers, are often designed to use the same interrupt line and can conflict with one another. Most of these conflicts can be resolved by changing a jumper or two, but the PC can accommodate only a limited number of devices.

Doubling DMA

The PC AT neatly solves the problem by adding a second interrupt controller. Intel designed the 8259A to be cascadable, allowing one to be hooked to another. The missing definitions among the original eight interrupts have been formalized, while the second chip handles additional tasks, such as the 80287 math coprocessor, the real-time clock, and the new hard disk controller. Four of the new interrupts have been labeled "reserved."

The second DMA controller extends the old limitations, which were four channels of 8-bit DMA, capable of moving up to 64K bytes at a time. One of the channels on the second chip is dedicated to synchronizing its activity with the first chip. The other three move up to 128K of data at a time in 16-bit words, anywhere within the AT's 16-megabyte address space. This design effectively doubles the throughput for 16-bit I/O devices such as the new hard disk controller.

These extensions, as IBM likes to call them, are very much in keeping with the added capabilities of the PC AT. Hardware and software manufacturers alike will have a great time using these new features. —**Bill Machrone**

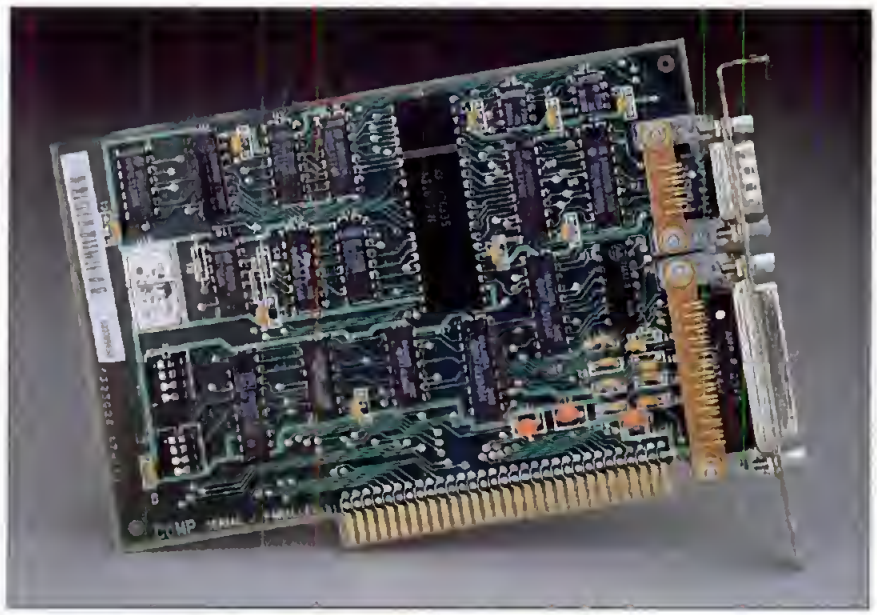
scrolling, and pokey performance. Once you watch your favorite program accelerate through its normal operation, it's hard to go back to an ordinary PC or PC-XT. Programs run noticeably faster off the AT's hard disk than on a memory drive on the PC or PC-XT. If this machine had wheels they'd be out there reviewing it in *Car and Driver*.

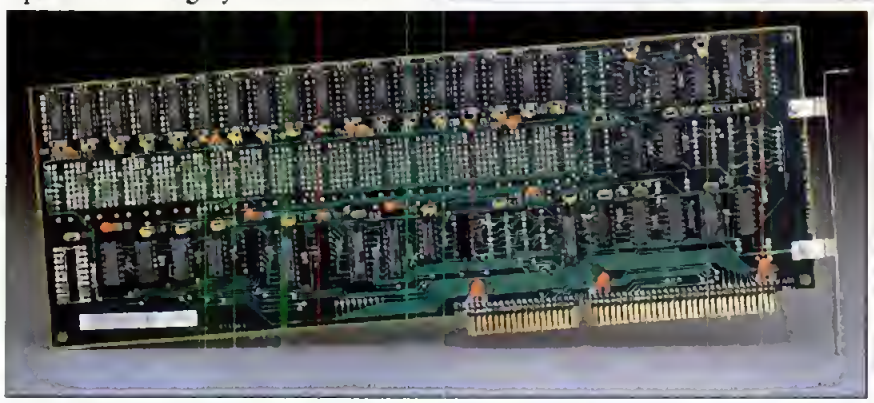
Backup Woes

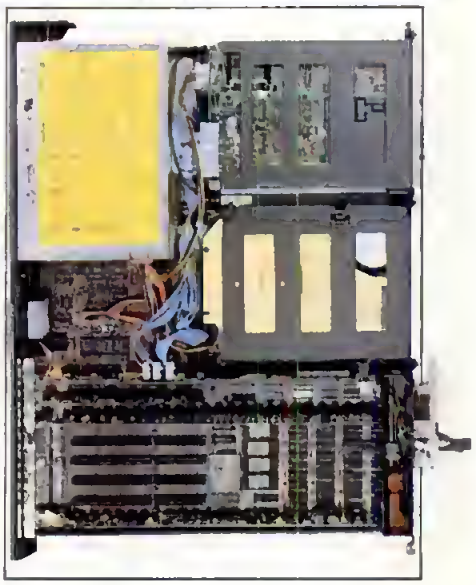
The AT offers many other advantages over its predecessors. One of the biggest is its ability to salt away well over 40 megabytes of data and access it all in a jiffy. While some fixed disks on the market store more information in the same amount of space, IBM's are blazingly quick—file access is more than twice as rapid as the 10-megabyte snails on the PC-XT. And 40 million characters is a hefty hole for you to pour information into—the equivalent of 20,000 double-spaced pages.

Hard disk backup is still not effortless, but the AT's high-density floppy can store more than three times as many files as standard double-sided 360K floppy disks, reducing the worst-case, 20-megabyte hard-file backup total to 17 floppy swaps. While this total is far better than the 56 it would take with standard double-density floppies, it doesn't hold a candle to the Compaq DeskPro's built-in tape backup. Expect a raft of half-height on-board streaming tape systems for this purpose, first from enterprising third-party suppliers and eventually from IBM.

The AT's high-density floppies add a whole new dimension to micro incompatibility, but they can store 600 pages of text on a single disk, making file portability from machine to machine far easier. However, there is a trade-off—the price for increased storage capacity is another nightmarish situation in which IBM isn't compatible with itself. A high-density drive can read and write standard DOS 2.x, 360K floppies, but, since the tracks on which it writes have to be narrow to







TOP: New IBM Parallel/Serial I/O card comes standard in the expanded PC AT.
LEFT: New AT 128K memory expansion card.
RIGHT: PC AT with cover removed. New Intel 80286 CPU is square chip in center of the motherboard.

squeeze more information in the same amount of space, disks it creates or updates may not work on standard PC or PC-XT drives. AT owners who need to switch disks between ATs and older IBM micros will have to install a matching, beige 320/360K half-height drive in the lower drive expansion slot. But the AT can handle only three physical drives, which means that a second hard disk and a

The Key to Status

The same key that locks up your AT can unlock the door to social success.

'Tis in my memory locked,
And you yourself shall keep the key of it.
—Hamlet, Act I, Scene iii,

One of the AT's more interesting new features is a lock adjacent to the lacquered gray IBM logo. While most observers simply chalk this off to increased data security, they are missing a critical point: With it, IBM is making an important fashion statement.

Let's say you're a fast-track executive on the make. The dollar-sign key on your AT is already starting to wear out while most buyers are still waiting for their systems to be delivered. There's an ultra-sophisticated *1-2-3* macro named after you. You have Paul Volcker's unlisted modem number at the Fed. But, when you visit the local watering hole after hours to unwind, you're just another cruising Brioni suit.

How do you tell the world you're something special—a fifth-level black-belt AT master? IBM has just made it easy.

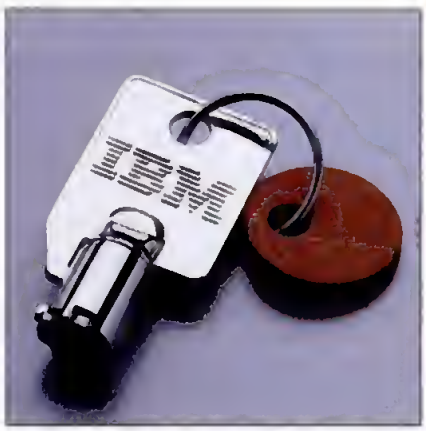
You simply thread one of the two AT keys IBM supplies onto a white-gold chain and drape it around your neck. Doff your Hermes tie, pop your shirt buttons halfway down your chest, amble over to some sweet, young, computer-wise thing nursing a kir, and let the room light glint mercilessly off the letters "IBM" and into her eyes. Franz Mesmer swinging a watch couldn't do better.

The AT-key-on-a-chain is guaranteed to work better than any other dangling talisman currently in vogue—crosses, stars of David, double eagles, Hebrew letters, chromed razor blades, tiny golden fists, coke spoons, dog tags, and more, sometimes worn all at once in a clattery pectoral display. One AT key hanging over your heart puts the others all to shame.

The AT key can also work its magic in the locker room or on the squash court. Right before you climb into your jodhpurs or powder a three-wall shot just out of your opponent's reach, reach down and study the message incised into the back of it: "DO NOT DUPLICATE." You are sui generis, nonpareil, without equal. Unstoppable. They broke the mold. The competition doesn't stand a chance.

If you're uncomfortable about high-fashion singles neckware, you can always twist the AT key onto your pocket keychain and take it out at a critical moment. Closing that crucial deal? Remove the keyring from your pocket in one smooth motion and pretend to use the nail nippers, but make sure the AT key jingles noticeably while you pare the offending cuticle. Or slap the ring noisily down onto a bar or restaurant table to get attention; with the unusually-shaped AT ring prominently displayed you're sure to command respect, even adulation.

Of course, the key has one other



320/360K floppy drive are mutually exclusive. And to compound matters, IBM warns that high-density floppy disks won't work on standard double-density drives.

The single disk controller add-on board can handle two 20-megabyte Winchester hard disks and any two floppies; the single I/O board contains both serial and parallel ports. This arrangement frees up two of

"How do you tell the world you're something special—a blackbelt AT master? Simply thread one of your AT keys onto a chain and drape it around your neck."

use—it helps define the power structure inside your office. A humming, untended PC or PC-XT is an invitation for someone to come over and start sorting files or rippling through a *1-2-3* simulation. This can be especially galling when the files they're manipulating are yours. The AT locks 'em all out.

Even more terrifying is that when you fill a hard disk with your company's confidential records, it's possible for an interloper with a nut driver to snap off the cover, twist out the hard disk, and walk through the front door with all your firm's sensitive files under his arm. To the security guard it's just a can with a few wires hanging out; to you it's your job, your whole future, down the sewer. But not with the AT. To pry the cover off you need the sinews of a Schwartzenegger and a crowbar the size of your leg.

The key itself is manufactured by the Chicago Lock Company, an old-line Midwest outfit that holds the patent on this ultra-secure round key usually found on pinball machines, jukeboxes, burglar alarms, and Manhattan apartment doors. Referred to in the trade as a "tubular lock," the mechanism was dreamed up by CLC founder Lyle Schinn in 1934.

IBM likes the lock because it offers the maximum security in the smallest physical package available. The smaller the lock, the harder it is to make it exotic. IBM wanted something that wasn't flimsy and easy to defeat, but didn't take up

half the chassis.

A typical lock, like the one in most desks, has about 225 "key changes" or tumbler combinations. Chicago's tubular lock has thousands. And it's difficult to copy. Any locksmith can grind out duplicates of conventional keys, but it takes special machinery to produce tubular ones.

Still, IBM has finally come up with the perfect fashion accouterment. Put away your anachronistic Phi Beta Kappas, your passé Playboy keys, the Siegel to the executive washroom, or the Medeco that gets you into the corporate pied-a-terre. This clearly is the status key. Expect a chainful of imitators from the likes of Apple and AT&T before long. —**P.S.**

"A new setup program on the AT stores the important system configuration data in 64 bytes of nonvolatile, battery-powered, CMOS memory."

the eight slots, leaving six for expansion. One additional slot must be filled with a display driver. The unused slots, five of which have an extra socket for 16-bit addressing, can be stuffed with memory, an SDLC or binary synchronous commu-

Goodbye, Mr. DIPS

New AT owners will be relieved to find out that the machine has no DIP switches—it uses a set-up program instead.

One of the most frustrating jobs for many PC and PC-XT users is resetting the pair of DIP switches deep inside the bowels of their computers each time they decide they want to reconfigure their systems.

The switches are tiny, poorly labeled, hard to see, and difficult to manipulate. IBM located these switches in a canyon of boards and drives under such a thicket of cables that switch setters often feel like tropical explorers slashing through the liana. And moving the minuscule pieces of plastic back and forth can be nerve-wracking; some scientist out there may have a long, strong, skinny tool with a grain-of-sand light bulb at the end of it, but it's not on the rack at my local computer store.

These switches tell the computer how many disk drives are attached, whether an 8087 is in its socket, how much memory is on the motherboard, and what display mode to use as the default. Set one wrong and your system will probably work erratically—or it may not work at all. And it's far too easy for novices to flip the wrong switch, or to dislodge a cable in the process.

One Big One

The AT has none of these problems. It has only one switch—for selecting the default display—and it's large, isolated, and easy to find. All of the other settings are handled by a new setup program on the AT diagnostics disk that stores the important system configuration data in 64 bytes of non-volatile, battery-powered, CMOS memory.

The setup program prompts you for the time and date, the number of drives and their sizes and "types," the amount of memory installed both on the motherboard and on any expansion boards, and which monitor is the primary display. Once you enter all this information, the battery-powered RAM retains it even when the main power switch is turned off. If new memory or drives or displays are later attached, you simply have to rerun the diagnostics/setup program and indicate the change.

From Switches to Chips

All of this magic is performed by a new Motorola Realtime Clock/Complementary Metal Oxide Semiconductor (RT/CMOS) chip and powered by a 6-volt, long-life lithium battery pack. The battery comes from the factory unplugged; you have to attach the wires hanging out of it to a connector on the system board. The clock uses the lower 14 bytes of the chip's 64. The rest of the memory is dedicated to storing the configuration data and checking what it detects is in the system against what has been stored. And it's smart enough to recognize when a time and date are valid or invalid and whether the default monitor setting matches the actual hardware in the machine.

The clock boasts many slick features,

nications adapter, a cluster adapter, or a network adapter.

Some of IBM's older cards, such as the color/graphics adapter, have "skirts" that extend the active part of the printed circuit board below the normal lower edge. Because of the way the additional 16-bit sockets have been arranged, such skirted boards will fit only in the two of the eight slots not configured for 16-bit memory addressing. This, however, will undoubtedly be remedied as new, more powerful boards replace the old ones.

IBM is offering half-megabyte memory expansion cards, and third-party vendors are hinting that they'll soon release 4-megabyte AT memory add-on boards populated with 256K RAM chips. These boards can add up to a whopping 16 megabytes or more of RAM, which can be used either for multitasking—loading in all your application software at once—or as an immense virtual drive.

One of the most popular add-ons for the PC and PC-XT is the multifunction memory board, a hybrid printed circuit card that combines additional RAM with parallel and serial I/O ports and a clock calendar. The Enhanced AT has all these features built in. Its 512K of 16-bit addressed motherboard RAM is plenty for many users, and IBM will be happy to provide an additional 128K on a 16-bit board (already drilled and soldered for more). All system memory is parity checked. A clock and calendar are built into the system, and the Enhanced AT comes with its own parallel and serial card.

The motherboard is crawling with 64K RAM chips, piggybacked into 128K modules. The AT is a superbly engineered and constructed machine, but this design is a kludgy way to handle RAM. In keeping with the rest of this state-of-the-art machine, IBM probably should have installed 256K RAMs instead of four times as many 64Ks. While 256K RAMs are not yet common, neither is the 80286. The designers probably chose the smaller chips to keep the cost down.

IBM has two tricks up its sleeve to prevent excessive down-time. The internal

such as the ability to operate under Daylight Savings Time or Standard Time and in 12- or 24-hour cycles (the defaults are Standard Time and a 24-hour clock). It also comes with a built-in alarm although there is little documentation on this. The clock even devotes a byte (&H33) to the setting of the current *century*—IBM must have some really long-term plans for this machine.

Programmers and practical jokers who want to read or write to this memory can easily do so through ports &H70 and &H71. To write data to the CMOS RAM, first key in OUT &H70, ADDRESS and then OUT &H71,VALUE. The addresses and values are listed starting on page 1-45 of the AT's *Technical Reference* manual. To read what is currently stored in this memory, first type in OUT &H70,ADDRESS followed by IN &H71. This process will give you a byte's worth of information; you'll have to mask out or otherwise extract the necessary bit data yourself.

One of the more interesting values in the *Technical Reference* listing is in the table of hard disk drive types. Of the 15 possible hard disks, the version *PC* examined was type 2, which has 615 cylinders and 4 heads and formats to 20 megabytes. Type 9 is listed as having 900 cylinders and a whopping 15 heads, which suggests that IBM may soon be offering a massive hard drive with far more storage than the current version.
—P.S.

"The AT is superbly engineered and constructed; but its motherboard, crawling with 64K RAM chips, piggybacked into 128K modules, is a kludgy way to handle RAM."

"The AT is a marvel that will be the basis of many IBM upgrades over the next year or two."

fan is attached to a thermostat that detects potentially destructive heat buildups and increases the flow of cooling air. And the entire machine has a full-year warranty rather than the usual 90 days of coverage. Added to IBM's deserved reputation for support and reliability, this warranty deflates most reservations about buying such new technology. It also infuriates avaricious dealers who were counting on fat first-year repair bills to further pad their nests.

Showing Its Colors

IBM has also designed virtually all of the AT's optional features to be user-installable, from the 256K memory module kit for the less expensive version, to the 4-MHz 80287 math coprocessor, to the additional floppy or hard drive. IBM provides a dark plastic "decorative rear panel" to dress up the back of the machine. This panel seems silly; the AT is so well designed and put together that, the octopus of internal cables notwithstanding, it would look just fine in a shell of clear lucite. Even the details are handled well, such as the trim, free-standing rack of long-card supports in the AT. (Think of the rickety plastic snap-ons inside the PC and PC-XT.)

As important as what IBM did announce for the AT is what it didn't announce—at least initially. The official IBM dealer's guide shows photographs of seven AT systems, and only one of these at the very end has a squinty mono monitor attached. The others all sport IBM's 2-year-old RBG monitors. It took 3 weeks for IBM to announce its new slate of high-resolution color cards and screens (see the first page of the PC News section in this issue). These late arrivals round out the AT into a true state-of-the art machine.

"How Fast Is It?"

"These tests show that the PC AT is so fast . . ."

Sooner or later, it's time to stop talking about how fast the PC AT is and put it through its paces. Below, we've subjected it to a variety of tests that measure both processor execution speed and file access times. For comparison, we put it up against a standard PC-XT, an AT&T PC 6300, and a Compaq Deskpro. The latter machines are two of IBM's most significant competitors.

The first test, a BASIC program, executes an empty loop 10,000 times.

The next test checks the load time for a 100K text file. We used *XyWrite II*, which uses all available memory for a file.

The third test creates a file of twenty 1,024-byte records 10 times, and the fourth test reads the same file back in. Both of these tests are in compiled BASIC.

The fifth test simply sorts one thousand randomly generated words of from 1 to 10 letters, using the DOS sort utility. The final test uses Lotus's *1-2-3* to recalculate a spreadsheet of 500 by 14 cells.

As you can see from the results, the PC AT is clearly a fast machine. It belongs in the first rank of desktop computers. Is it so fast that you need to rush out and buy one? Let your application be your guide.—**Bill Machrone**

Test	Computer				
	PC-XT	PC*	AT	Deskpro	AT&T*
Count to 10,000	0:10	0:10	0:04	0:03	0:04
Load 100K File	0:04.9	0:10.9	0:02.4	0:03.6	0:11
Write Test	0:16	2:35	0:08	0:19	2:36
Read Test	0:10	1:28	0:08	0:09	1:27
Sort 1,000 Records	1:04.3	1:07.8	0:27.3	0:36.2	0:39.9
Recalc Spreadsheet	4:01	4:01	1:36	2:08	not tested

*With floppy disk

IBM also neglected to release a new printer and, in fact, officially supports only two for the AT, both dot matrix: the 80 cps (Epson) IBM Graphics Printer and the 200 cps (IDS) IBM Color Printer. This short list seems a bit absurd to me, especially in light of the impressive new generation of printers *PC* is testing for an upcoming mammoth printer-roundup issue. Dot matrix printers such as the Toshiba 1351 run circles around the Epson/PC; other fully-formed character and laser printers are far better suited to the needs of the AT user than the mediocre ones sold under the IBM label.

And, not all existing IBM hardware will operate on the AT. The list of proscribed IBM parts includes the current Asynchronous Communications Adaptor, Binary Synch Communications Adaptor, SDLC Communications Adaptor, Parallel Printer Adaptor, Expansion Unit, Memory Expansions, Compact Printer, and non-AT keyboards, disk drives and hard disks. In addition, IBM admits that only 75 percent of the third-party software it tested would work on the AT. But this situation should change as manufacturers scramble to make their products compatible.

However, it is clear that IBM is in the race for the long haul and equally clear that the AT will be its main box for the foreseeable future. The AT is an ultra-high-performance technological marvel that will serve as the basis of many IBM upgrades over the next year or two. As a standalone workstation it's unbeatable. The competition might just as well make and sell toasters.

One of the AT's most highly touted abilities is multitasking. While it's true that under MicroSoft XENIX, users can tie a whopping two computers to an AT (soon to be expanded to 15, according to several sources), who in the world is going to bite? IBM is doing the same thing to XENIX that it did originally to CP/M-86—offering it at a high price and not making it sound very good. Every time reporters at the New York product introduction asked an IBM spokesman a question about XENIX they received such a cold shoulder they didn't need air conditioning in the room.

IBM would rather sell its broadband LAN, which strings together up to 72 users over a 1,000-foot radius, boasts a sophisticated collision-detection mechanism, and supports data transmission rates of up to 2 megabits per second over coaxial cable. This new PC Network (see "IBM Nurtures a Network," this issue) is based on one IBM PC Network Translator Unit and individual PC Network Adapters in each PC, PC-XT, or AT. Each translator can be linked to an IBM PC Network Base Expander hooked up to 64 other IBM micros or compatibles.

Only PCs with new improved ROM BIOS can plug into the network. To find out whether your system needs a new BIOS chip (BIOS Update Kit #1005), load BASIC, then type in and run the following program:

```
10 DEF SEG=&HF000
20 FOR X=&HFFF5 TO &HFFFF
30 PRINT CHR$(PEEK(X));
40 NEXT
```

If you see a date of October 27, 1982, or later, your computer can plug into the network without any changes; if it's earlier you'll have to buy the Update Kit. Another way to check is by examining your PC's serial number. If it's lower than 300960, you have the old, inferior BIOS.

Total World Domination

IBM is seriously gunning for the business market. Not just a big piece, either. It wants the whole ball of wax. And the AT is the right vehicle. It's priced right, and its performance is head and shoulders above the others. In its primary dealer support literature, IBM counts off the reasons why everyone should buy it. For first-time users, there's "ease of use, upward growth capability, IBM reliability and service, [and] state-of-the-art technology." For "experienced users who require increased function and who have an existing investment in IBM hardware and software" there's "processing speed, high performance numeric processing, multitasking potential, large data storage capability, I/O expansion capability, [and] interconnectivity and networking."

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Competitors Whistling in the Dark

Competitors who dismiss the AT as an overexotic multi-user machine in a land of standalone users or as just a jazzed-up PC-XT are whistling in the graveyard. Speed and power are the name of the game, and the AT has both—in spades. The price is reasonable, almost too much so. Who is going to wait 10 minutes for a PC-alike to get an important job done when the AT can do it in 3?

What will happen to the legions of PC lookalikes? This innovative machine is so good that IBM is shooting fish in a barrel. With a cannon. If any competitor other than resource-heavy AT&T and perhaps management-skilled Compaq survives this tsunami, it deserves to prevail. Otherwise it's just a two-way battle between the communications giants. IBM has done it again. You have to give it credit—and hope some other company will have the persistence to stay in the game long enough to keep prices low and technology hopping. ■

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COVER STORY • BILL MACHRONE

IBM NURTURES A NETWORK

Networks are for sharing—files, printers, plotters, hard disks. Does IBM bring anything new to the relationship? Yes: PC Network has more power than anything we've seen yet.

Photograph Shig Ikeda

"PC Network is a real network. It connects up to 72 PCs in a 1,000 foot radius via broadband coaxial cable."

IBM's new PC Network may be the best network *PC* has ever seen. It's uncharacteristic for *PC Magazine* to get excited about an undelivered product, but there's sufficient justification this time.

PC-compatible networks are barely a year old. PCNet, ShareNet, EtherSeries, Omninet, and others were the pioneers that defined the basic services available to networked PCs (see "Battle of the Network Stars," *PC*, Volume 2 Number 6). In the past year, roughly 20 entrants have joined the fray. IBM even came out with a product, the PC Cluster. It was so tepid that IBM declined even to call it a network.

IBM's new entry is dramatically different. Although the network has been announced, it won't be available until the first quarter of 1985, probably by the end of January. This report is based on IBM's published specifications and technical documentation for the network, as well as some limited hands-on experience at its press introduction.

For starters, I'd like to say that PC Network is a *real* network. It connects up to 72 PCs in a 1,000 foot radius via broadband coaxial cable. With broadband amplifiers and equipment available from cable television vendors, the system can interconnect up to 1,000 PCs and can extend over several miles. PC Network doesn't require a dedicated server. Machines designated as servers can also be user workstations while they are sharing resources with other machines on the network.

Data packets on PC Network zip around at a 2-megabit-per-second clip. While not the fastest (3Com's EtherSeries is rated at 10 megabits), 2 megabits is certainly fast enough to access files over the network at hard disk speeds. When the network is served by a high-performance machine like the PC AT, you would have a tough time telling the difference between a file accessed over the network and one from a local hard disk.

Although the network was introduced at the same time as the PC AT, it is not dependent on the AT. It can be implemented with any mix of PCs, ATs, XTs, or Portables, as long as at least one node is equipped with a hard disk. Obviously, the network will perform better with a machine of the AT's caliber, but any hard disk PC will do. Remote hard disks appear as additional drives on local machines. The network permits remote printer access as well.

Dynamic Duo

Two things make this network go—IBM's Network Adapter Card and the *PC Network Program*. Together, they include a collection of state-of-the-art features unavailable in their entirety from any other source. IBM codeveloped the network card with Sytek, Inc., a Mountain View, California, company that specializes in broadband networks. The card packs an enormous amount of on-board intelligence, relieving the computer of most mundane chores involved in running a network.

The *PC Network Program* runs under DOS 3.1, a version identical to DOS 3.0 except in that the commands for networking are functional. Specifically, it implements file sharing and read-only protec-

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(800) 426-3333
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CIRCLE 743 ON READER SERVICE CARD

tion of files. It also gives you password control over specific drives and files. The password protection even extends to the print servers. The machines designated as file servers can be print servers as well; but a hard disk is needed to spool print jobs.

IBM didn't stint on print resources: each file or print server can share up to three DOS print devices, and the queue for each can be up to 100 files deep. As you might expect, IBM included software to manage the queues. Actual printing takes place in background mode and does not interfere with normal system operations.

Using the *PC Network Program* is a pleasure. Like most other networks available for the PC, it is a simple, logical extension of regular DOS commands. It also gives you a full-screen operating mode with menus, a message editor, and limited windowing. These features make the network's functions easy for the nonproficient user. Those with more experience will probably prefer to use the command line interface and call network commands from the DOS prompt. The documentation points out that the full-screen interface can be run as an application program, so it is likely that *TopView* users will find it convenient to reserve one task as a window onto the network (see "The TopView Phenomenon" in this issue).

One of PC Network's unique features is that every node carries a name of your choosing, such as "Bill's AT" (wishful thinking) or "Server 1." You use these names to steer data and print files around the network, as though it were a DOS directory name. You can also use these names to send messages to other users, a rudimentary electronic mail capability.

The *PC Network Program*'s features are modular and configurable, starting with the "redirector" function. In this mode, you can redirect file I/O requests and print requests out to a server machine. The remote resources behave as if they were attached directly to your machine.

The next level, "receiver," allows your machine to receive network messages and to route them to the console, a file, or the local printer. The machine receives messages at the same time as it executes local programs.

The "messenger" level adds a full-screen editor to these functions and allows you to forward messages to multiple users. You can switch between the application and the full-screen network mode.

The top level is "server," at which your machine can also share its disk and print resources with other users on the network, concurrent with local application programs. This layered approach gives you, as system designer, easy control over the power granted to each user. Also, inexperienced users needn't be baffled or intimidated by network functions that they don't need to know about.

Hardware Heaven

The software features of the *PC Network Program* are impressive enough, but

Figure 1: PC Network offers these functions from the DOS command line. They are also available to the casual user through menu-driven screens. This relatively simple set of commands controls all the network functions.

Command	Function
NET START	Start up one of the four Network Program configurations
NET SHARE / NET USE	Share and use network resources
NET PAUSE / NET CONTINUE	Suspend and resume network operations on a machine
NET SEND	Send a message(s)
NET LOG	Log message(s) to display, printer or a file
NET NAME	Add a name to a machine for receiving message(s)
NET FORWARD	Forward a name to another machine so that message(s) can be received there
NET PRINT	Print a file on a network printer or get status of print queue
NET SEPARATOR	Define a separator page to be printed between print files on a print server
NET ERROR	List the network error log
NET FILE	List the current users and current record locks for a file
MODE	Set the character and line spacing of a network printer
PERMIT	Standalone single-session version of the file server

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what really makes them fly is the raw power of the PC Network Adapter. This card clearly raises the ante for capabilities among smart network controllers.

The heart of the card is a 80188 processor, which runs at 6 MHz. An Intel 82586 communications controller and some custom circuitry from IBM and Sytek aid and abet this processor. You might say that this card has more power than a standard PC, and you wouldn't be far off the mark. The difference is that it is dedicated to network functions, not to general-purpose computing. Its 32K of ROM-resident programs includes powerful, high-level network commands. In other networks, many of these functions must be handled by your computer or by the server. The card further increases its speed and holds down host overhead by transferring data via DMA (direct memory access). This technique lets the adapter talk to the network while the host computer runs application programs. The network card interrupts only long enough to transfer a received packet of data into the host's address space.

One of the interesting features of the card is that it lacks the usual bank of DIP switches for setting a unique network address. Instead, each card has a serial number burned into a small ROM when it was manufactured. The setup program consults this identification code and uses it when you name your node ("Bill's AT"). This feature, innovative for a network card, will also permit designers to build in ironclad security and copy protection controls.

Like some earlier networks, PC Network permits machines to boot over the network so that they needn't have any disks at all to be functional. This ability is very desirable in some high-security applications where preventing removal of data is important. Another benefit is that, in addition to saving costs, this capability can free the uninitiated user from the complexities of booting the system with a floppy disk.

The software on the program ROM is a full BIOS (basic input/output system) for the network. It has many sophisticated features, such as protocols, name control, and logging in of users. It is interesting to note that the NETBIOS supports up to 32 concurrent sessions on one card, as well as access from multiple operating systems without conflict. IBM's overview documentation states, "There can be multiple names associated with each adapter card and the names are globally known on the network." The mind reels at the possibilities, but the potential seeds for true distributed processing are sown in this card. The programmer's "hooks" for multiple users and multiple tasks are already in place. The documentation explains clearly how to use them.

The PC Network Adapter card also maximizes its own efficiency. It allocates the 16K onboard RAM to assemble and transmit the largest possible packets of information for maximum speed. It auto-

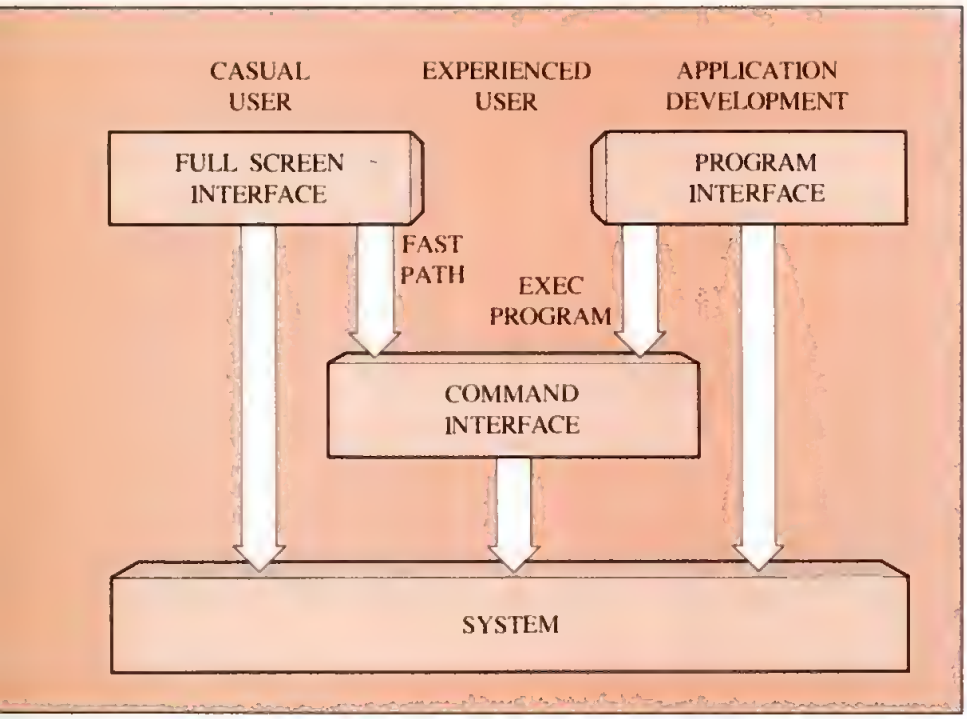

Figure 2: A schematic depiction of the user interface to PC Network. The "fast path" allows the user to bypass menus by giving the desired command. Application programs can communicate directly with the network through DOS calls or can go through the command interpreter.

matically divides memory among multiple users when they are present and reallocates it when users log off.

Ethernet

IBM's protocol scheme is about as close as it can get to Xerox's Ethernet and not be Ethernet. It employs a CSMA/CD (carrier-sense multiple access with collision detection) protocol, pioneered on Ethernet. It uses a broadband cable, permitting other data services and even cable television functions to share the cable at the same time without causing any interference.

Ethernet could have been implemented in cable form with broadband techniques, but it wasn't. In fact, the early research on CSMA/CD was done with broadcast radio communications, not on cables. Coaxial cable came as a later refinement—a way of limiting to a confined space the "ether" through which the electrical signals travel.

IBM has made the decision not to follow some of the standards that were set forth in Ethernet, a flex of corporate muscle toward AT&T and other Ethernet licensees. Since most people probably won't want to mix and match network adapters on the same cabling system, IBM's departure from its standards doesn't really threaten Ethernet's position, especially in some of its more advanced applications such as AT&T's mini-to-micro systems and Xerox's office automation networks.

IBM's broadband system uses two 6 MHz signals (the same bandwidth as a television channel), one to receive data and one to transmit it. The adapter card has an RF modem, an actual transmitter and receiver pretuned to these channels. This scheme requires the use of a "translator" or retransmitter. Its function is simply to take everything it "hears" on the receive frequency and resend it on the transmit frequency. The flow of data on the cable is directional, and the translator ensures that every station gets a full, strong signal.

If you figure that standard 75-ohm cable can easily carry 50 television-like channels, 48 channels are still unused in PC Network. These spare frequencies can be used for teleconferencing, data exchange on nonconflicting frequencies, security monitoring, or standard cable television distribution. Most users of PC Network will never use the cable for anything more than PC-to-PC communications, but to some this feature will be a godsend.

The cabling system that connects the network adapters is the same 75-ohm stuff used for cable television. IBM has a line of products that connects host systems in a network with a radius of up to 1,000 feet. It includes lengths of cable, signal splitters, multiple taps, and the like. The documentation recommends commercial CATV equipment (not by name) as a source of proper signal distribution gear for larger networks. Meanwhile, IBM has neatly divided the cabling options into convenient short-, medium-, and long-distance kits. You can mix and match with relative ease. You won't get into trouble as long as you adhere to IBM's guidelines. At some point, however distant, you'll have to call for technical support from a CATV house to amplify and balance the network.

Conclusions

PC Network is a milestone in local-area networking. It is among the most technologically advanced, the most powerful, and easiest to use networks available. None of these qualities has been strong suits for IBM in the past.

The PC Network shares the PC AT's cutting edge outlook; IBM is packaging and offering the Network in the same open-architecture fashion as the AT, which will make it immediately acceptable to end users and highly attractive to third-party software developers. ■

"PC Network permits machines to boot over the network so that they needn't have any disks at all to be functional."

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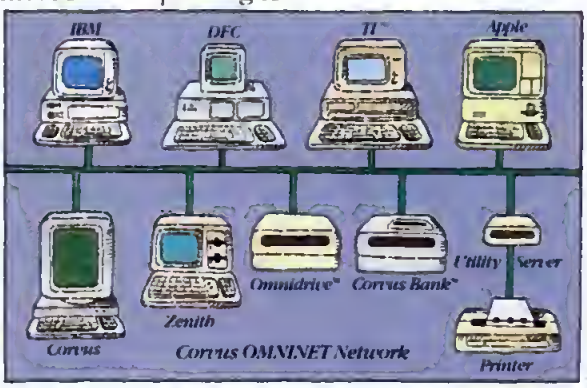

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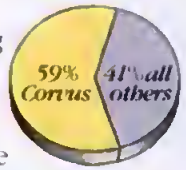

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CIRCLE 124 ON READER SERVICE CARD

A Bridge Between Mainframes and Micros

Cullinet's Information Database package for its GOLDENGATE integrated software promises to be the missing link that MIS departments have been seeking.

Illustration: Akio Matsuyoshi

Every time I pick up a computer magazine or newspaper I see a plethora of articles by MIS executives lamenting the lack of an effective micro-to-mainframe link. The link they seek is not simple file transfer or terminal emulation. What they want is a way to combine a PC's spreadsheets, graphics ability, and flexibility with the massive corporate databases already extant on their mainframe computers. Cullinet Software, Inc., has attempted to do just that.

Cullinet Software is a leading vendor of software for IBM's mainframe computers. Founded in 1968, Cullinet now boasts over 10,000 product installations worldwide. While you may not think 10,000 is a lot by today's microcomputer software standards, you must keep in mind that these products are on mainframe computers, for which software often costs more than $100,000. Cullinet's particular area of software expertise is databases (it used to be called Cullinane Database Systems). Cullinet's database, *IDMS (Integrated Data Management System)*, is one of the mainstays of the IBM world. *IDMS* is to a

microcomputer database what Dave Winfield is to the average Little Leaguer. They both play the same game with the same rules but with great differences in sophistication.

Cullinet's aim is to use its experience in mainframe databases to develop software on the PC that performs similar functions and gives you an effective interface to a mainframe's data. It recently introduced two products to achieve this goal. The first, *GOLDENGATE*, is an integrated software package that includes a relational database manager, a spreadsheet, a graphics system, a word processor, and a communications tool. It uses a common command syntax for all five of these tools and for the second product, the *Information Database*. The *Information Database* is a communications package linking *GOLDENGATE* on the PC to *IDMS*.

I recently had the opportunity to see a preliminary version of *Information Database* at Cullinet's headquarters outside of Boston, Massachusetts. While I was there, Cullinet executives explained to me in depth the concepts behind the software and ran the program through its paces for me. Since the *Information Database* was not to be released until September, and because I am a little shy of showing my maniacal methods of evaluating computer programs in front of other people, I did not give the product a thorough workout.

PC MACHINE

Information Database
Cullinet Software, Inc.
400 Blue Hill Drive
Westwood, MA 02090
(617) 329-7700
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CIRCLE 735 ON READER SERVICE CARD

The real beauty of IDB is that you never see it; you can use GOLDENGATE in almost complete ignorance of its existence.

However, I got a general feel for how the *Information Database* functions and how it works with *GOLDENGATE*. This information, along with a review of *GOLDENGATE* in the article that follows, "Integration at the End of the Bridge," should give you a good idea of what Cullinet's software is all about.

The *Information Database (IDB)* is the micro-to-mainframe link behind *GOLDENGATE*. This link is what separates *GOLDENGATE* from other integrated software packages such as *1-2-3*. *IDB* runs on IBM 370-family mainframe computers and chiefly works with Cullinet's relational database *IDMS/R*. It does work with VSAM files, and with a little more effort, will work with other vendors' databases as well.

IDB is not itself a database, but rather a front end to the actual mainframe databases. You can look at *IDB* as a card catalog in a library. It contains information showing you where to find different books in the library. The catalog does not contain the item you are looking for, just instructions on how to find the desired item. In a similar manner *IDB* does not contain data; it just knows where the data is. *IDB* goes a step beyond the card catalog; it not only contains instructions for obtaining an item, it goes and gets the item as well. *IDB* obtains the data from the mainframe where it is stored in *IDMS* format, converts it to ASCII format, reformats it for the integrated software package *GOLDENGATE*, and downloads it to the PC. Since you communicate only with *GOLDENGATE*, which translates your requests into a form that the *IDB* understands, you don't have to worry about comprehending the mainframe's way of doing things.

Unlike a library, *IDB* and *GOLDENGATE*, working in tandem, do more than just give access to a fixed store of data; they allow you to manipulate that data and create information. Like *GOLDENGATE*, *IDB* sees data as objects. An object can be a spreadsheet, a graph, a memo, or an entire database. To group related objects together, you store them in folders. Objects and folders are in turn stored in catalogs. When stored on your PC, objects are MS-DOS files and folders are subdirectories; catalogs correspond to storage devices such as drives and hard disks.

You can read and manipulate catalogs and their contents and then store objects back into folders and catalogs, just as readily as if you were storing them on floppy or hard disk. The benefit of storing objects on the mainframe through *IDB* rather than simply on your PC is that you can let other people with access to *IDB* see your objects and easily share the results of your work. You can even store any ordinary DOS file via *IDB*. You can take advantage of the large storage space on the mainframe and, more importantly, have the files backed up by the mainframe. *IDB* even includes a mail facility.

If you think a product that allows you to share files among multiple PCs and has a mail facility sounds a bit like a network, you're right. *IDB* is not a true network because the link is always to the mainframe rather than directly among PCs, but it does have many of the capabilities that people purchase networks for. If a company uses *IDB* it may find it has no need for a network as well.

The real beauty of *IDB* is that you never see it; you can use *GOLDENGATE* in almost complete ignorance of its existence. Except for initially establishing the connection to *IDB* in *GOLDENGATE*, you need use no *GOLDENGATE* commands to accommodate *IDB*. Information within *IDB* looks just like information on your hard or floppy disk. The only way to tell the difference is that remote folders are shown in one color, while local ones are in another. Since *GOLDENGATE* includes a relational database, it is a straightforward matter to combine different databases, whether local or remote.

To take full advantage of the *Information Database*, it often is useful to know what data is local and what is remote. Remote data, such as the corporate personnel database, is often shared with other people, while local data is private. A manager might keep performance reports for employees in a local database. This data could then be joined with such remote corporate data as salary and job descriptions for the same employees, in order to prepare annual raises, for instance. Next, this data could be included in a spreadsheet along with the departmental budget figures from *IDB* to help decide next year's salary for each employee. The final results, maybe in the form of a graph, could then be put in *IDB* and shared with other department heads or the corporate financial officer for inclusion in an annual report. This graph would be immediately available to other viewers, without requiring conversion or manipulation from a spreadsheet format by each viewer.

Lest any corporate chair cringe in fear that vital company data will leak out to every PC in the firm, be assured that *IDB* has security features to prevent unauthorized data access. A database administrator can restrict what data is available to each person. *IDB* gives the mainframe sophisticated means for protecting its valuable, and often sensitive, data. A manager might have access to his or her own department's employee data, but not to that for any other departments.

All this power and functionality does not come totally problem-free. The first problem is performance. One reason that PCs are so popular is that they liberate you from worrying about and contending with the high loads and slow turnaround times of mainframes. Furthermore, since a PC's terminal (its screen) is an integral part of the PC, the time it takes to display characters is minimal. On a mainframe, display can be much slower, especially if, as often is the case, the mainframe computer is in another building or even in another city. Although *GOLDENGATE* and *IDB* let you treat the mainframe's data as if it were stored locally on a hard disk, you will certainly notice a lag if you are in Des Moines and your company's computers are in New York City. If you are what is known in IBM parlance as locally attached (in the same building as the mainframe), the difference is not nearly so noticeable. These performance considerations are not really a reflection on *IDB* but rather on mainframes and their communications.

The most obvious problem is cost. *GOLDENGATE* costs $795 per copy, although Cullinet offers substantial quantity discounts. On top of this, the *Information Database* costs $75,000. Add to this the price of *IDMS/R* and its related products, and the total bill can be very large. These prices are not out of line for mainframe software, but they are still sizable. Furthermore, you must have an IBM PC-XT or an IBM PC with a 5-megabyte hard disk drive and a color monitor just to run *GOLDENGATE*. To use *IDB* you also need an IRMA 3270 emulator board and a connection to a 3274 in order to communicate with your mainframe.

GOLDENGATE costs $795 per copy, although Cullinet offers substantial quantity discounts. On top of this, the Information Database costs $75,000.

My final and most pressing concern is the critical mass necessary to make all this software and hardware work. You don't just buy some software for your PC and go off merrily and work. To really harness the full power of Cullinet's concept, you must first have some corporate data in a database, preferably in Cullinet's *IDMS* database. It should be carefully organized on your mainframe, a prerequisite that implies centralized control, most likely by your corporate or departmental MIS people. While most people would agree that this control is a good idea, it does run counter to the way in which the use of PCs has grown and flourished. Managers have often bought PCs as a reaction against, rather than an extension of, the MIS department. The *Information Database* brings together not only the mainframe and microcomputer, but their respective cultures as well. The benefits derived from this union may be enough to bring this melding about, but it will not be easy.

GOLDENGATE, used in conjunction with the *Information Database*, is a powerful tool. It is not, however, for everybody. Obviously, it is not something that you would use on your PC at home. It is targeted at corporations that have IBM mainframe computers and have, or plan to purchase, hundreds of XT-type computers. The costs are not negligible, but the benefit may be the micro-to-mainframe link that MIS departments have been searching for. ■

Bill Catchings is a systems programmer at Columbia University specializing in PC-to-mainframe integration.

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CIRCLE 128 ON READER SERVICE CARD

Integration At the End of The Bridge

GOLDENGATE, Cullinet's first software package for micros, puts it all together for you with a dazzling display of functions. It's destined to become a strong competitor.

Illustration: Akio Matsuyoshi

When a well-respected mainframe software house decides to test the micro waters, you would expect it to do so one toe at a time. But Cullinet, the venerable Massachusetts-based software house known for its mainframe database management systems, is entering the micro waters boldly. It has plunged into the hotly contested integrated software market with its new *GOLDENGATE* system.

GOLDENGATE, Cullinet's first micro package, gathers word processing, database management, spreadsheet manipulation, graphics, file management, and communications (sync and async) into a compact, beautifully documented package for $795. *GOLDENGATE* bases its concept of integration on a few ground rules: all screens and menus are identical; special-purpose keys and functions do the same thing in the various programs; and you can readily transfer files among the programs with minimum intervention.

GOLDENGATE is also designed to work with the *Information Database*, a program that links it to mainframe data-

bases and downloads information for manipulation on the PC. (See previous article, "A Bridge Between Mainframes and Micros.")

PC Magazine had the opportunity to look at *GOLDENGATE* before its release to the public. The package suffered from a few prerelease jitters, but clearly, Cullinet could very well become a major competitor in the integrated software market with this new standalone integrated system for PCs.

The System's Heart

GOLDENGATE's Information Management Tool (IMT) is at the heart of the system. Basically, IMT is a DOS shell that shows drives, directories, subdirectories, and files graphically in the form of a tree. It lists them when you ask it to "open" an element of the tree.

GOLDENGATE substitutes office terminology for computer jargon. It calls a drive, for example, a catalog; a subdirectory, a folder; and a file, an object.

The package's programs (called tools) supply their own extensions to files, translated into plain English in the IMT displays. A spreadsheet file named COSTS shows up in the IMT display as a COSTS worksheet. An edit file of the same name appears as a COSTS document. Similarly, a file from the database manager shows up as a COSTS data table. You can also add a brief explanation of the file's contents, such as "first-quarter" COSTS. *GOLDENGATE* will show it in the IMT display along with the expanded file name.

PRODUCT INFO

GOLDENGATE
Cullinet Software Inc.
400 Blue Hill Drive
Westwood, MA 02090
(617) 329-7700
List Price: $795 for standalone version
Requires: 5-megabyte hard disk drive or XT, 320K RAM, IBM Color/Graphics Adaptor, DOS 2.0.

CIRCLE 734 ON READER SERVICE CARD

The menu selection techniques seem to use the best elements of Microsoft's Multiplan and Lotus's 1-2-3

To explore directories, subdirectories, and paths, you either use cursor keys that highlight elements or type in DOS-like commands.

One of *GOLDENGATE*'s more interesting features is its file-first system for entering programs. Also, you can use all *GOLDENGATE* tools in the usual way. Selecting the Edit tool, for example, puts you in the word processor. You can then tap a function key to see a menu of document type files (objects) and load the object (or objects) of your choice. Or you can start in the IMT and put the cursor over a file (object). If you tap the "Open" function key, the system will read the file type, put you in the appropriate tool, and load the selected file. Opening a document file, for example, puts you in the Edit tool, with that file active. Opening a worksheet file puts you in the Spreadsheet tool, with that file active.

Human Factor

GOLDENGATE's project directors admit that they reviewed available software for microcomputers carefully, looking for the best ideas other firms have used in developing new ways for incorporating the human factor into the interfaces. They seem to have adopted the best. As I mentioned, all menus and work screens are identical from tool to tool. The menu selection technique seems to use the best elements of MicroSoft's *Multiplan* and Lotus's *1-2-3*.

Each tool, for example, has a four-line message element at the bottom. The first line is reserved for status and error messages, the next two for the command menu and "microhelp" (a brief explanation of a selected command), and the bottom line for keyboard input. In addition, you can use cursor keys to highlight elements in the command menu you want to select, or you can enter the first letter or two of the command to invoke the action. *Multiplan* and *1-2-3* users will feel right at home.

If you're experienced, you can type in a whole string of commands, using their abbreviations. You can even turn on the Teach function to record the string of commands as a macro procedure. Later you can call the procedure (or Open it from the IMT menu) to invoke the complex command.

Cullinet's use of color in *GOLDENGATE* is the best I've seen. You use one of the package's tools, called Prepare, to set up the system. A color page in Prepare enables you to choose colors for dozens of screen attributes in the other tools. The Spreadsheet tool, for example, shows labels in white, numeric values in green, negative numeric values in red, and command menus and system comments in two tones of yellow. The cell grid is in light blue.

GOLDENGATE's Tools

The package's tools, or its programs, share some of the best elements Cullinet has incorporated into the overall system. First, the Edit tool comprises a full-blown word processing system that has all the features you would expect from a top-of-the-line word processor. You can use it to handle tables of contents, chapter headings, footnotes, and indexes automatically. The system is menu driven or command driven, at your option.

In addition, the Edit tool can read sections of spreadsheet files. Plus it can graph

pictures and automatically insert their images into the text. And, as you would expect, you can use *GOLDENGATE*'s Edit tool with its Database tool to generate documents that have database information imbedded in them.

Cullinet did not compromise quality in an effort to integrate the system when it gave individual tools their capabilities. Like the Edit tool, the Spreadsheet tool is a complete system in itself. It uses the best techniques of *1-2-3* and *Multiplan*, including highlighting to define cell ranges and prompting for the most probable next action. It also performs a complete array of arithmetic, string, and logical functions, including vertical and horizontal table lookup.

The Spreadsheet tool can read DIF files from the outside world, ASCII text files from the Edit tool, or rows and columns of data from the Database tool. You can also use it to read rows and columns of data from an outside database by using the Emulator (communications) tool. The spreadsheet uses alphanumeric cell identifiers (A1, A2, and so forth); it has 256 columns and 2,048 rows. (Since an active spreadsheet must fit in memory, its size is memory dependent.)

The Spreadsheet tool has much in common with the Database tool, even though they are entirely separate devices. (This particular characteristic of *GOLDENGATE* differs from the database manipulation used by Lotus's *1-2-3*.) The Database tool uses both memory and mass storage, and so a database file is media bound (up to 64K records), unlike the spreadsheet, which is memory bound.

Database fields (columns) can encompass as many as 72 positions before they become truncated. You can simultaneously open up to six data tables, and you can arrange fields from those tables in up to six "views" of the tables.

Suppose you maintain two departmental data tables, budget and actual expense. Once a month you want to compare the budget table with the actual expenses (updated weekly) table. First you would open both data tables in the database manager and extract the information necessary from each to form a "view" in the database. You could actualize the budget here or move the information in the view to the spreadsheet to analyze in detail.

You can save rows or columns of information from either the spreadsheet or the database, as ranges for the Graph tool. Finally, you can hold this information for the Edit tool, to include in a presentation. You can prepare the presentation using the Edit tool or send the output from the Edit tool to the Emulator, to be transmitted electronically.

Meanwhile, you can use the spreadsheet calculations to update any of the database tables.

In Cullinet's view, the database and spreadsheet functions are so closely aligned that it has incorporated a toggle that lets you bounce back and forth between the two tools. Additionally, most arithmetic and logical functions of *GOLDENGATE*'s spreadsheet are available in the database for you to select and calculate on the fly.

Emulate is *GOLDENGATE*'s communications tool. You can use it as a smart asynchronous terminal with upload and download capability and automatic control through a Hayes compatible modem. Or the Emulator tool can emulate an IBM 3270 terminal if you install an optional communications board. It can handle synchronous direct communication with a mainframe through *Information Database*, Cullinet's micro-mainframe link.

> The Edit, Spreadsheet, Database, and Emulator tools could compete with the best.

Cullinet gives you an interactive tutorial on two diskettes as well as more than 600 pages of documentation on how to use *GOLDENGATE*. In my opinion both the tutorial and the documentation (stored in two 8½-by-11, three-ring binders) are much better than what usually accompanies software for microcomputers.

Putting It All Together

The most significant test of an integrated software package is how it puts it all together, integrating the functions it handles for you. As far as integration of functions is concerned, Cullinet has done its job well. It has carefully and thoughtfully put together a system that uses identical menus, keystrokes, and prompting schemes in each of its tools.

Also much to its credit is Cullinet's refusal to compromise with the features of *GOLDENGATE*'s individual tools. The Edit, Spreadsheet, Database, and Emulator tools could compete on their own, outside of an integrated package, with the best word processors, spreadsheets, database managers, and communications packages.

One compromise I did notice, though, was in speed, despite the fact that its designers wrote *GOLDENGATE* in the C language to optimize speed. Loading a long file into the Edit tool, for example, takes about twice as long as loading the same file into a standalone word processor. Similarly, the time the Spreadsheet tool takes to update the cells in a large spreadsheet is about double the time a standalone spreadsheet takes to do the same task. Apparently the added time spent handling files is part of the price you pay for the advantages an integrated package offers.

If you are in the market for a well-implemented integrated package for your PC, be sure to put *GOLDENGATE* on your personal review list. My guess is that it will be one of the strongest competitors you will consider. ■

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CIRCLE 221 ON READER SERVICE CARD

IBM's UNIX FORMULA FOR YOUR PC

PC/IX multiplies your PC-XT's responsiveness and factors in the power of a larger system. The cost? Ease of use and disk performance.

In the realm of multi-user microcomputer systems, UNIX has rapidly emerged as the industry's de facto standard operating system. IBM made a commitment to UNIX when it supplied an implementation of XENIX, as well as PC-DOS 3.0, for its multi-user PC AT. In the world of single-user PCs dominated by MS-DOS, however, UNIX is just beginning to make an impact.

PC/IX is the first implementation of UNIX for the IBM PC available directly from IBM. With its introduction, IBM has firmly endorsed UNIX as an alternative operating system for the PC.

Advocates of UNIX have hailed it as a "real" operating system with the features needed to support powerful applications on the next generation of microcomputers. Critics counter that UNIX is difficult to use, as well as much too large and cumbersome to be effective on a personal computer. Clouding the issue are the newer releases of MS-DOS, which include some of the most notable features of UNIX, such as its hierarchical file system, input/

output redirection, and pipes.

With IBM's PC/IX you can now judge the merits of UNIX for yourself. *PC* took a first look at PC/IX when it was announced early in 1984 (see "IBM Goes UNIX," *PC*, Volume 3 Number 11). The present in-depth review gives you more information.

All There—and Familiar

PC/IX is a real, live UNIX implementation for the IBM PC-XT. Experienced UNIX users will find in PC/IX all the familiar utilities and tools included in the minicomputer and the supermicrocomputer UNIX versions. With only a handful of exceptions, it's all there—all 5 megabytes of it.

One of the key features of the PC/IX operating environment is its multitasking ability. The system can execute many different programs concurrently. It can, for example, sort a file, prepare a report, and print a series of files at the same time you are editing a document.

PC/IX's hierarchical file system, also one of its key features, enables it to group files into directories and subdirectories that reflect their natural organization. As a result, you can more easily locate and manage stored data. In addition, PC/IX treats files and devices identically so that programs can perform input and output on disk files, terminals, printers, and so forth, without first being modified.

Another key feature of the PC/IX environment is the UNIX shell, PC/IX's powerful command interpreter. The shell supports such convenient features as input/output redirection, pipes, and the ability to manipulate groups of files with a single command. You can also use the shell as a programming language; it allows even unsophisticated users to execute a predefined sequence of commands.

PC/IX includes more than 200 UNIX utility programs for sorting data, processing text, and searching files. The utilities form a powerful set of tools that you can combine to accomplish many tasks without having to write new programs.

Although it supports only a single user at a time on the PC-XT, PC/IX retains the multi-user features of UNIX, such as security and accounting. Several users can share a PC-XT effectively by using these features.

PC/IX also offers a rich assortment of tools that support specialized tasks such as processing text and developing software.

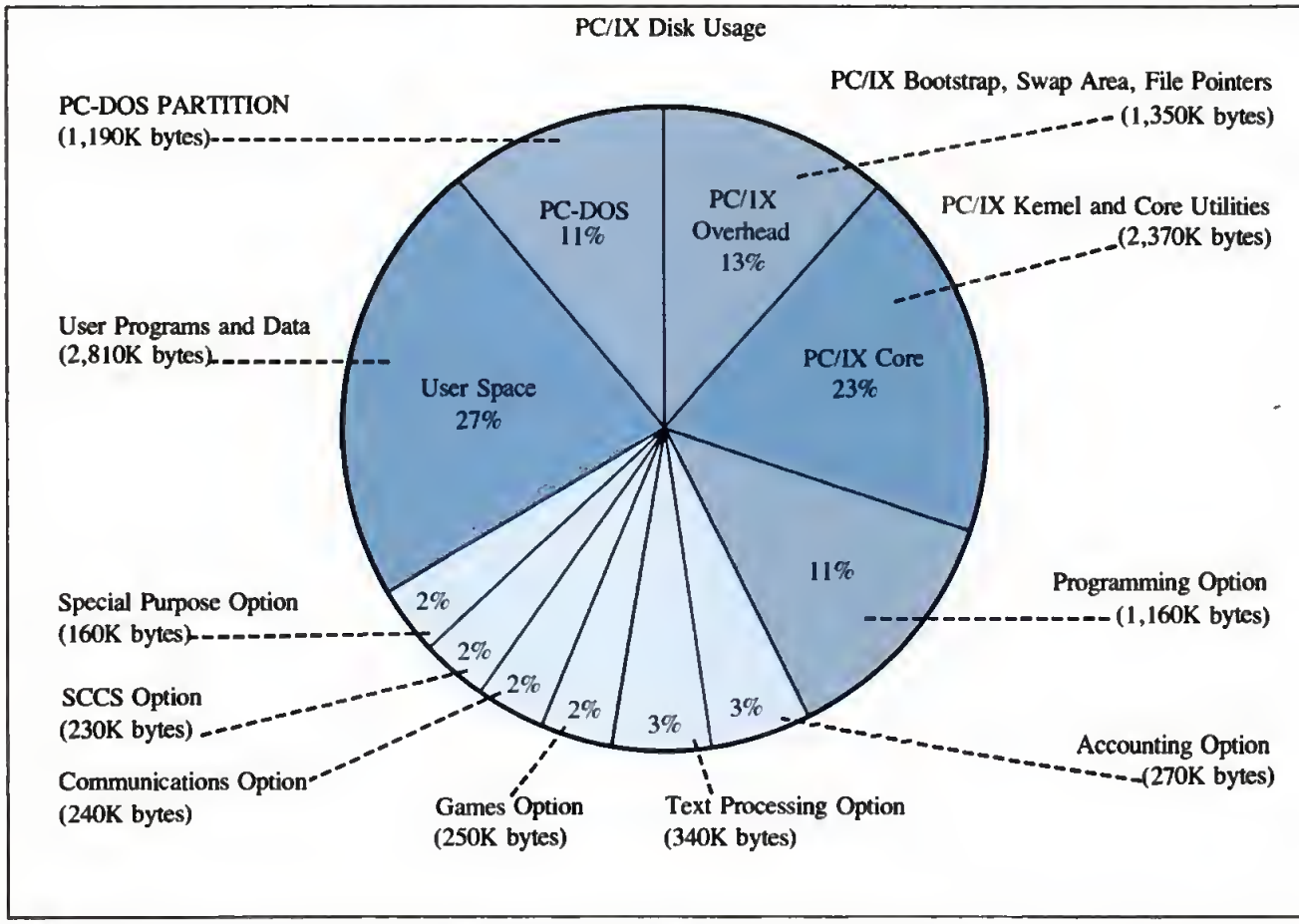

Figure 1: *PC/IX uses about two-thirds of the space on the PC-XT's hard disk, leaving only about one-third for user programs and data.*

Installation and Operation

IBM distributes PC/IX on 19 diskettes, packaged in an attractive binder. Four other binders contain the PC/IX documentation. The PC/IX user's manual (about 1,000 pages) describes the system command by command, in alphabetical order. The text processing guide, the programmer's guide, and the system manager's guide offer a more topical approach to the PC/IX system and its capabilities.

The 19 diskettes are coded by color and grouped by function into an operating system core and optional facilities. The core of PC/IX, in eight disks, includes its kernel and the minimum set of utilities required to operate the system. The programming function, in four disks, includes the C compiler, the assembler, the debugger, and other tools for developing software. The source code control system, in one disk, is PC/IX's utilities that maintain a library of source code to support large programming projects. The communications function, in one disk, includes utilities that give asynchronous communications access to other computers. The text processing function, in one disk, includes utilities that prepare text, tables, mathematical equations, and so forth, for printing. One special-purpose disk includes miscellaneous utilities, including support for text formatting on phototypesetters and laser printers. The accounting function, on one disk, includes utilities that collect data on system usage and print a variety of accounting reports. In addition, a games disk has word and mathematics games such as Hangman, Fish, and Moo. Finally, the maintenance disk includes standalone programs for system maintenance, diagnosis, and installation.

Before you can use PC/IX, you must install it on the PC-XT's hard disk. Installation is a fairly straightforward but time-consuming process. We spent about 45 minutes (with a few mistakes along the way) installing the core diskettes before we could get a UNIX prompt to appear on the screen. We spent nearly another hour loading the remaining diskettes and completing the installation.

Comparison of PC-DOS and PC/IX

	PC-DOS	PC/IX
Total System Software	about 500K bytes	about 4.5 megabytes
Commands and Utilities	about 45	over 200
Minimum Main Memory	64K bytes	256K bytes
Recommended Main Memory	128K bytes	512K bytes
Minimum Mass Storage	320K bytes floppy disk	10 megabytes hard disk + 320K bytes floppy disk

Figure 2: *The relative complexity of PC/IX compared with PC-DOS is reflected in the amount of software supplied, the number of commands and utilities each supports, and the typical system configuration each requires.*

The installation process requires that you divide the hard disk into one or more partitions in which PC/IX and other operating systems may reside. This feature is very handy, since even the most enthusiastic UNIX user will probably want to be able to store PC-DOS applications or data files on the hard disk to use occasionally. However, PC/IX is so large that a majority of the disk must be devoted to its use. We allocated just 35 tracks (about 11 percent of the disk) to a PC-DOS partition, and we used the rest for PC/IX. If you want to use the hard disk for serious PC-DOS *and* UNIX work, you'll need to invest in an extender chassis and a second hard disk.

Figure 1 summarizes how PC/IX uses the space on the PC-XT's hard disk. With all the optional parts of PC/IX installed and the small PC-DOS partition reserved, we had about 2.7 megabytes (or 27 percent of the disk) left for user programs and data files.

PC/IX and UNIX

PC/IX is based on UNIX System III from AT&T. Interactive Systems Corporation of Santa Monica, California, adapted the operating system to the PC-XT for IBM. Experienced users will feel right at home with PC/IX, since the system includes the familiar Bourne shell as its user interface. It also includes all the standard utilities for file processing, text processing, program development, and communications.

Interactive has also added several programs and features that improve the standard AT&T version. They simplified user administration with a menu-driven `adduser` utility for adding users and establishing system security. A more powerful program that can handle multiple printers, different paper sizes, and priority printing replaces the System III spooler. Interactive has supplied detailed instructions with the system configuration files on how to reconfigure the system. It has also included several of the popular Berkeley utilities.

Another group of utilities unique to PC/IX gives you a useful PC-DOS interface. These programs support file exchange with PC-DOS floppies or a PC-DOS partition on the hard disk. Using them with Lotus's *1-2-3*, you could, for example, print a large spreadsheet into a PC-DOS file and then read this print file into a PC/IX file for use by the UNIX utilities for

processing both text and tables.

PC/IX lacks only a few of the "standard" parts of a commercial UNIX system, such as the spooler, the `tar` utility for file backup, and the remote job entry system. You can modify applications that depend on these features so that they can use their PC/IX counterparts. A more serious omission is the `vi` full-screen text editor. Developed at the University of California at Berkeley, `vi` is a passionate favorite of UNIX programmers. Its absence may dampen the acceptance of PC/IX by veteran UNIX users.

Interactive substituted the `INed` text editor for `vi`. `INed` incorporates limited word processing features; it includes a number of advanced facilities, such as multiple editing windows and a "history" mechanism for returning to earlier versions of an edited file. Programmers will also like its features that support software development, such as the ability to begin compiling a program automatically when exiting the editor. However, we found `INed` to be an awkward editor to use in practice. It does not support word-by-word cursor motion, and its command syntax is inconsistent. `INed` handles text formatting and justification through step-by-step procedures that invoke separate PC/IX programs.

`INed` is very different in style from modern word processing programs with all of their familiar amenities. If you expect to use `INed` for word processing, you will most likely be disappointed with its features and ease of use.

Despite Interactive's additions and changes, PC/IX retains the essential character of UNIX—a decidedly mixed blessing. PC/IX gives the experienced UNIX user all the capability normally associated with UNIX. The typical PC-DOS user, however, will probably be overwhelmed by PC/IX's complexity. The PC/IX documentation (like the UNIX documentation from which it is derived) still lacks a conceptual, top-down overview of the system. As a result, installing, using, and maintaining a PC/IX system requires a

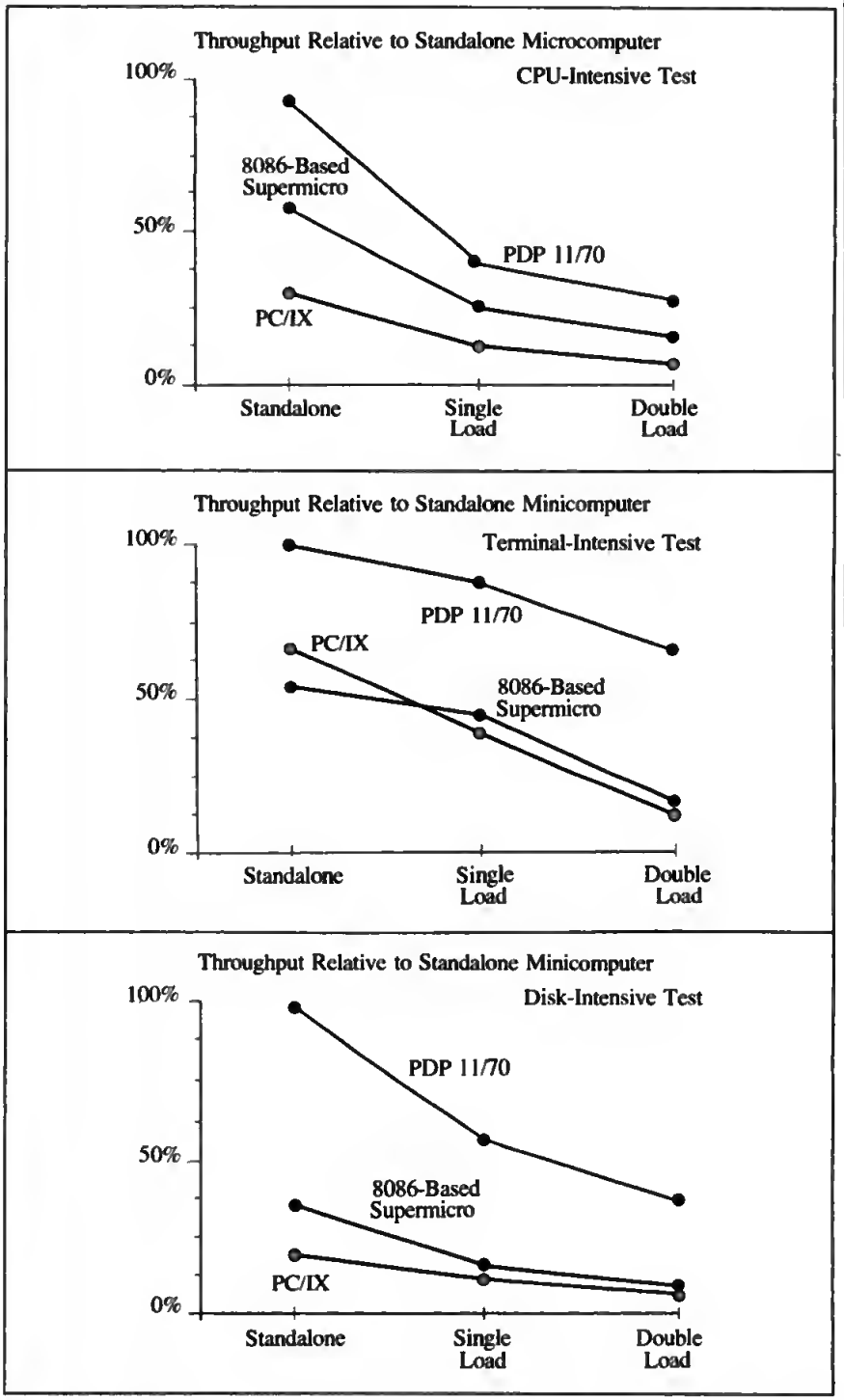

Figure 3: *Comparative UNIX performance is shown by these three graphs, which depict the relative throughput of a UNIX-based minicomputer system (PDP 11/70) and the PC-XT running PC/IX. An 8086-based supermicrocomputer system capable of supporting up to five users under XENIX is also included for comparison.*

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PC/IX versus PC-DOS

For most PC users, the key question about PC/IX is how does it compare to PC-DOS? Figure 2 shows the vast difference in scope and complexity between the two operating systems. PC-DOS still reflects its origins as a compact, efficient system for the single-user PC. PC/IX reflects the origins of UNIX as a minicomputer operating system that supports the development of multi-user programs.

With the introduction of PC-DOS 2.1 and 3.0, however, PC-DOS versions have been steadily moving closer to UNIX. They already incorporate a hierarchical file system, pipes, and input/output redirection. PC-DOS 3.1 will include multitasking support. Future versions of DOS will probably continue the trend toward UNIX features.

Despite this convergence of the two operating systems, PC/IX still enjoys a major advantage over PC-DOS in the depth and sophistication of its utilities. An excellent example is the PC/IX utility `grep`, which searches files for occurrences of a particular pattern. PC-DOS 2.1 includes a similar utility, called FIND. But the PC-DOS utility allows matching only on a literal string of characters, whereas `grep` supports full pattern matching based on regular expressions. Similar contrasts can be drawn for the other UNIX utilities that have DOS counterparts. Furthermore, the vast majority of the UNIX utilities that support text processing, program development, communications, and file processing have no parallel under PC-DOS.

Performance

If you are accustomed to a UNIX time-sharing system, you may find that PC/IX has an unusual performance profile. Operations that mostly display information on the screen occur very fast. The INed editor, for example, has a very quick feel compared to a full-screen editor running on a time-sharing terminal. Disk-intensive operations, on the other hand, feel very slow. Copying files and loading programs takes much longer than on a UNIX-based mini or supermicro system. CPU-intensive operations fall somewhere in between. If you are accustomed to a heavily loaded VAX/UNIX system, you will probably find that the dedicated 8088 microprocessor in the XT offers CPU power similar to your "share" of the VAX.

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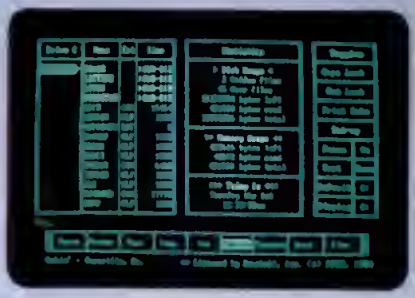

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mark, a standard benchmark suite for measuring UNIX-based supermicro systems. The benchmark tests the commercial performance of a UNIX system under a multitasking load. It consists of three separate tests: the CPU-intensive test uses the UNIX sort utility on a small file to test CPU-related data processing performance; the terminal-intensive test outputs streams of characters to user terminal(s), measuring the terminal I/O performance of the system; the disk-intensive test checks disk I/O performance by reading sequentially through a disk file. Each of the tests is first run by itself (standalone) and then in a multitasking mode together with the other tests (single load). Finally, the multitasking load is doubled (double load) by running the single load test in parallel with itself.

Figure 3 presents the benchmark results for PC/IX and compares them to a minicomputer-based, UNIX time-sharing system and a multi-user, 8086-based supermicro. The performance graphs measure throughput, expressed as a relative percentage of the standalone UNIX-based minicomputer system.

The CPU performance graph shows the PC-XT with roughly 25 percent of the raw CPU horsepower of the PDP 11/70. However, the minicomputer's CPU performance degrades rapidly under load, as the CPU is consumed with terminal I/O and other tasks. A lightly loaded PC/IX system (running a few tasks on behalf of a single user) thus compares very favorably with the minicomputer under a multi-user load that is moderate to heavy.

Terminal I/O performance is one of PC/IX's strong points. Again, the PC-XT's performance is comparable to that of the minicomputer's terminal under multi-user load. Note that the PC is capable of much higher screen I/O performance using low-level programming techniques typical of popular PC-DOS applications. Standard UNIX utilities, however, are written for character-oriented I/O through a well-defined system call interface and do not use these techniques.

The disk I/O test shows a large difference in performance between minicomputer disks and the PC-XT's relatively slow 5¼-inch hard disk. Disk performance on the PC-XT suffers even further with its 8-bit I/O bus, as compared with the 16-bit bus found on minis and supermicros. PC/IX delivers only about one-

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sixth of the minicomputer's raw disk performance. Disk-intensive applications will suffer the most when moved to the PC from other UNIX-based environments.

PC/IX is a complete, full-featured UNIX implementation for the IBM PC-XT. Under PC/IX, the PC-XT becomes a viable single-user UNIX system for developing programs, processing text, and executing user-developed UNIX applications. The PC-XT's performance under PC/IX, while not stunning, is certainly adequate. If you are accustomed to using UNIX on a PDP-11 or VAX time-sharing system, you will find PC/IX's performance comparable to those systems under a moderately heavy load.

With its communications capabilities, PC/IX also makes the PC-XT an excellent UNIX workstation when connected to a larger UNIX multi-user system. This configuration may be the most appealing application for PC/IX; it offers the user the convenience and responsiveness of a personal UNIX system, coupled with the mass storage capacity and file-crunching power of a larger system.

An Open Question

Despite the appeal of PC/IX as a UNIX implementation for the PC, two broader factors may stand in the way of its potential market success. The first of these factors is the lack of applications software. Although the body of software now available for UNIX-based supermicros is growing rapidly, vendors have thus far ported little of it for use under PC/IX. UNIX-based software vendors have also traditionally relied on manufacturers and OEMs for distribution; to offer software under PC/IX, they need new retail and Fortune 500 distribution channels.

The second factor is the uncertain position PC/IX occupies in the IBM PC product line. With the introduction of XENIX for the PC AT in August, two different UNIX versions are now available from two different IBM organizations. PC-DOS 3.1, with its support for multitasking and PC networking, represents yet another alternative. Which one of the three operating environments will dominate in the long run is still an open question. ■

Jim Groff and Paul Weinberg are the coauthors of Understanding UNIX: A Conceptual Guide *published by Que Corporation, Indianapolis, Indiana*

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Delving into dBASE III

We've scrutinized the commands and functions in dBASE III to see where it's improved over its predecessor, dBASE II, and where it's not.

Illustration: Greg Couch

Using *dBASE II*, the leading database management program for the PC, has always been something of a love-hate affair. It's easy to love the interactive environment, the ease of creating a database and entering data, the ability to get reasonably complicated tasks done quickly and easily, and the flexibility and speed of coding that *dBASE II* makes available to the more advanced user and programmer. On the other hand, *dBASE II*'s limitations and poor performance are often enough to drive you straight up a wall. Its maximum number of fields is constricting; its limited data types are primitive; its language is often awkward and, especially in its early versions, buggy; and, perhaps worst of all, its execution is *slow*.

Now *dBASE II* publisher Ashton-Tate has introduced *dBASE III*. Ashton-Tate does not consider *III* an upgrade of *II; dBASE II* will continue to be sold for both 8-bit and 16-bit systems. The new *dBASE III* is available initially only for IBM PCs and compatibles, but it may be available for other 16-bit systems later. Since the new product is written in the C language rather than in assembly language, porting it to a wide spectrum of computers should be reasonably easy. This portability is important to commercial software developers considering *dBASE III;* the more systems the product runs on, the greater the market potential. *dBASE III* retails for the same $695 long charged for *dBASE II*, while the earlier version's price has been dropped to $495.

The major improvements in *dBASE III* are in database constraints, user interface, language enhancements, documentation, and speed of execution. I'll cover each in turn. During *PC*'s massive "Project: Database" series, I looked at a prerelease beta version, but here, I have reviewed the actual production product.

Database Limitations

dBASE II suffers from several design limitations that reduce its usability in some circumstances. The most serious is its 32 field limitation. While tricky programming can sometimes circumvent this limitation (see "Advanced dBASE II Programming Tricks," *PC*, Volume 3 Number 2), certain applications cannot use *dBASE II* because of the small number of fields available.

Some of the other *dBASE II* limitations present more problems to the advanced user or programmer than to beginners. Having only two files open at a time often leads to clumsy file manipulations, and the limit of 64 memory variables also demands some fancy footwork in complex applications. The *dBASE II* limits of 65,000 records and 1,000 characters in a record and its limited math accuracy are not as often a problem, but serious business applications sometimes run afoul of these restrictions as well.

If you look at the table in Figure 1, you can see that *dBASE III* addresses these constraints with a vengeance.

Even these increases don't tell the whole story. It is difficult to manipulate long text fields with *dBASE II* because of its 254 character limit on a character field (a limit retained in *dBASE III*, by the way). To circumvent the problem, *dBASE III* adds a new field type called Memo. Each Memo field takes ten characters in the data file as a sort of place holder. The actual text can be up to 4,000 characters if *dBASE III*'s built-in text editor is used or up to an incredible 512,000 if an external word processor is used to create the text. The actual text is stored in a separate file linked to the main data file. Thus it might be fair to say that *dBASE III* records can be up to half a megabyte each!

dBASE III also adds another new field type to store date information. While date manipulation can be programmed in *dBASE II*, it is complex and cumbersome. *dBASE III* handles dates in a simple manner and includes a long list of functions to convert dates to character strings and do date calculations.

The bottom line is that programmers using *dBASE II* often run into that program's limitations like a truck running into a brick wall. That collision simply won't happen with *dBASE III*. It can store and manipulate immense amounts of data, and its limitations on fields, memory variables, and open data files are unlikely to be a problem.

User Interface

dBASE II has always been notorious for its cryptic user interface. After the program signs on, a bare and uninformative period appears as a prompt. That's it—no menus, no messages, no nothing. While later versions of *dBASE II* include a help provision that allows you to ask for information on specific commands, this function is only a slight improvement. Executing some of the commands results in no

dBASE III
Ashton-Tate
10150 W. Jefferson Blvd.
Culver City, CA 90230
List Price: $695
Requires: 256K RAM, two disk drives, DOS 2.0.

CIRCLE 733 ON READER SERVICE CARD

	dBASE II	dBASE III
Fields per record	32	128
Records per data file	65,535	1,000,000,000
Characters per record	1,000	4,000
Open data files	2	10
Numeric precision	10 digits	16 digits
Memory variables	64	256

Figure 1: *Differences in capacity between* dBASE II *and* dBASE III.

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By Software Arts™

27 Mica Lane, Wellesley, Massachusetts 02181

CIRCLE 212 ON READER SERVICE CARD

HOW TO RULE

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3 The Handy Notepad.

You're Napoleon. You're in the study when your wife Josephine comes in and tells you, "Ze pipes are broken and zere is water in ze loo." "Ah weel feex that thing," you tell her, but since you don't have Get Organized!, you scribble down a note to yourself on the nearest paper which, unfortunately, turns out to be the Order of the Day. Nine hours later your army is clobbered in a Belgian village you never heard of.

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5 The TeleComm Package.

You're Queen Victoria. An excited young man arrives with Get Organized! and a curious metal box. He claims they will instantly connect you with the Empire by means of something called "electronic mail" and "a terminal emulator." He promises wealth and knowledge through "The Source," "Dow Jones," "CompuServe," "MCI," and "MCI Mail." His name is H. G. Wells. You decide he is quite mad and dismiss him. A century later, you're lucky to still have the Falkland Islands.

6 The Index Card File.

You're Joan of Arc. You're on a roll, but certain people are threatening to make things too hot for you. Get Organized! would've let you keep up-to-date info on your friends and foes. Like resumes, statistics, or even birthdays. Who knows? The right birthday card to the right Inquisitor at the right time could have made all the difference.

7 The Calculator.

Imagine how useful this would have been if you were John Maynard Keynes. Simple arithmetic would have revealed the terrible flaw in your economic theory. Governments the world over would not be printing worthless money to cover their debts. And this program would be a lot cheaper.

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CIRCLE 173 ON READER SERVICE CARD

screen indication of program activity. Records are displayed without any indication of the meaning of the fields. Many of the commands would be much more useful if their operation were modified slightly; for example, the BROWSE command allows you to display a screen of fields from many records, but scrolling through a single record is often of limited use because as you move along, the indication of what record the fields are in is no longer displayed.

dBASE III corrects almost all of these weaknesses. While the naked period is retained as the operator prompt, various options help you. The ASSIST command invokes a complete menu-driven system that allows interactive use of many of the available commands, even by inexperienced users. The full-screen menus are beautifully integrated with the PC, through use of the cursor control keys, screen highlighting, and other PC functions to simplify operation. Helpful explanations for all functions make ASSIST a valuable learning tool as well as a viable way to use the program (see Figure 2).

Time-consuming processes usually trigger a "tachometer" display in *dBASE III*, in which the progress of the process is shown as a fixed-position counter. For example, with the INDEX command a count of each record indexed is shown. With SORT you see the percentage complete, while for COPY FILE, the screen even shows the number of bytes transferred as a file copy is underway. These counters are interesting to watch and reassure you that something is happening.

dBASE III can, at your option, display a heading over output from the LIST and DISPLAY commands, showing the field titles. Prompting menus, somewhat like *WordStar*'s, are available on many commands. The operation of several commands has been improved; BROWSE, for example, allows you to lock fields onto the screen, so when you scroll through a record, its name field remains visible. BROWSE allows records to be added to the database as well.

Figure 2: *A* dBASE III *menu screen activated by the ASSIST command.*

Overall, *dBASE III* is much more "comfortable" to use than *dBASE II*. Its integration with the PC is excellent. Although it uses more of the PC's special keys, the old control characters also work, so *dBASE II* users don't have to unlearn old habits. On-screen highlighting and prompting are well done and helpful.

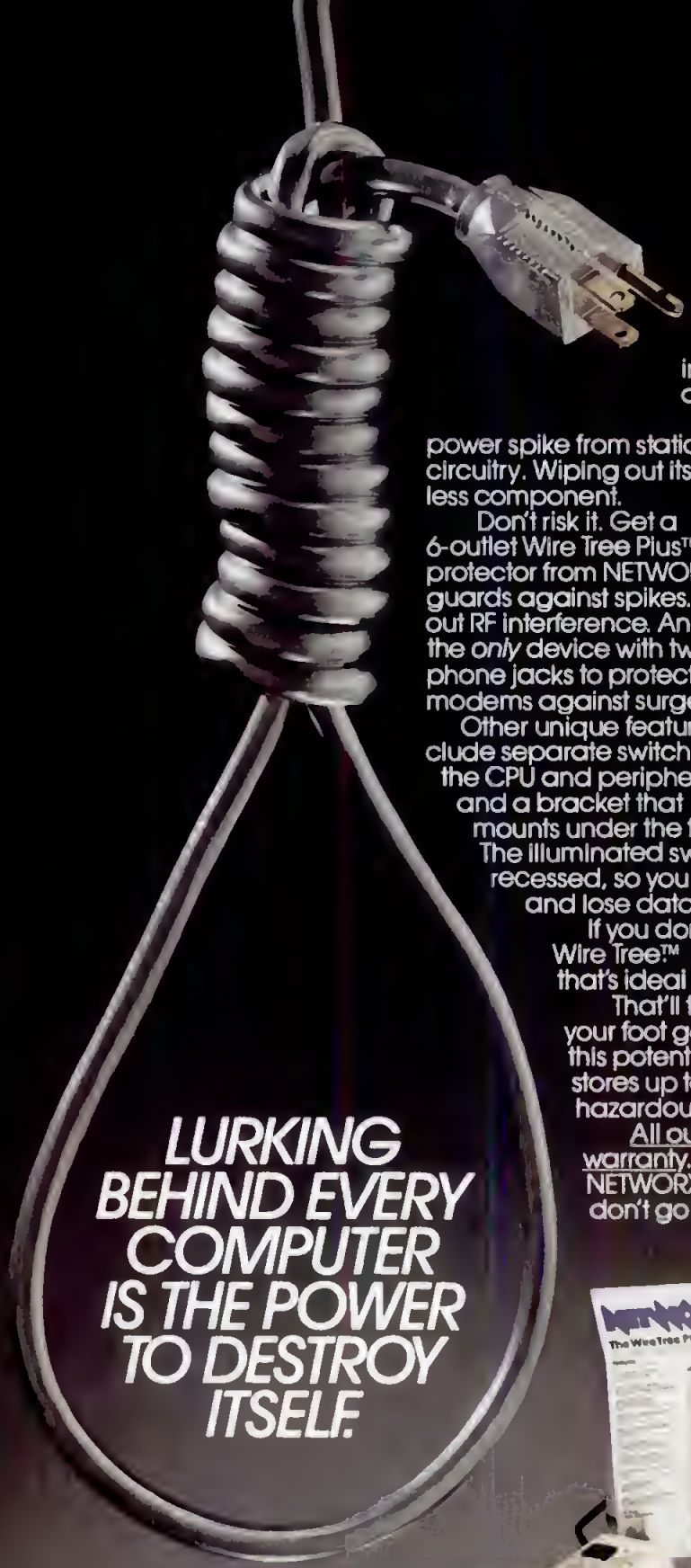
Language Enhancements

The high-level language included with all versions of *dBASE* has always been the main reason for the product's success. The language is more structured than BASIC, although several of the routines usually included in structured languages are absent (REPEAT-UNTIL and FOR-NEXT, for example). In addition, it is quite powerful, primarily because its data management commands are very high-level. Ashton-Tate's early claim that programmers could create complex applications using *dBASE II* in far less time than with more traditional high-level languages has indeed been proven correct. In many cases, you pay for the reduction in programming time with slower execution, but many business users find the trade-off worthwhile, given what programming costs these days.

dBASE III's language is cut from the same cloth as *dBASE II*'s, but the two are not the same. The command word has been changed for several commands and several others work somewhat differently. Although Ashton-Tate doesn't indicate this reason in the documentation, some of the changes seem dictated by the firm's use of C rather than assembly language to write *dBASE III*. Whatever the cause, the new syntax seems just as logical (and in some cases more so) as the old—it's just slightly different.

More importantly, several new commands have been added that increase the power of an already powerful language. Notably, the SET RELATION TO command allows data files in any of the ten available work spaces to be linked through common keyed fields. Ashton-Tate modeled the syntax for specifying fields in different data files after records in C and Pascal; it is easy to use and flexible.

One major change that many will consider a step back is *dBASE III*'s inability to execute DO-WHILE statements that con-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PC CONNECTION®

dBASE III's language is cut from the same cloth as dBASE II's, but they're not the same.

tain a macro expression. Ashton-Tate claims that leaving this capability out of *dBASE III* saves 30 percent in loop execution speed, but macro expressions are unusually powerful in DO-WHILE control statements. Like any other language peculiarity, this hole can be circumvented, but it would unquestionably have been better to leave the language alone and let the programmer pay the execution price if desired.

Ashton-Tate has made too many changes for me to discuss each one of them fully, but I have listed the differences between *dBASE III* commands and functions and those in *dBASE II*. I have also listed the new commands and functions in *dBASE III*.

While the improvements are many, I think Ashton-Tate blew it in one significant area. One of *dBASE II*'s terrible deficiencies is its lack of arrays, either numeric or string. Unfortunately, *dBASE III* doesn't have arrays either. Although some third party programs have addressed this lack in *dBASE II*, most notably the excellent *db!RA*, the lack of any array structure in *dBASE III* is a major flaw.

There are other small changes that any veteran *dBASE II* user would have liked included in *dBASE III* (such as longer variable names), but overall the *dBASE III* language is a real improvement.

Command Comparison

@. .GET—In *dBASE III*, additional CRT format options are available. For new datatype fields, a RANGE clause specifies upper and lower limits on numeric and date entries. A CLEAR clause clears screens below and to the right of a specified location (as in CLEAR EOS).

@. .SAY—In *dBASE III*, a PICTURE clause specifies format instead of the USING clause in *dBASE II*. Additional format options are available.

ACCEPT—In *dBASE III*, the CR (carriage return) response stores null (CHR(0)) to memory variable instead of a space in *dBASE II*.

APPEND—*dBASE III* can handle Memo and Date fields with this command.

BROWSE—In *dBASE II*, an optional command menu allows locking fields at left side of display (like a spreadsheet); editing of a single field; positioning to top, bottom, or specific record; and appending of records to the end of database. This *dBASE III* menu permits faster operation than with *dBASE II* because of *dBASE II*'s keyboard buffering system.

CHANGE—In *dBASE III*, this command uses a more flexible full-screen mode.

CLEAR—The *dBASE II* equivalent of this command, which clears the display screen, is ERASE.

CLEAR ALL—The *dBASE II* equivalent of this command, which closes data, index, and format files and wipes out all memory variables, is CLEAR.

COPY—In *dBASE III*, the STRUCTURE option copies database structure. *dBASE III* has no COPY STRUCTURE EXTENDED command according to the manual, but it worked for me.

CREATE—In *dBASE III*, this command defines field names, lengths, types, and creates database files, but there is no CREATE FROM command or no COPY STRUCTURE EXTENDED command to create a suitable model file.

CREATE REPORT—In *dBASE III*, this report generator's more flexible than the *dBASE II* REPORT FORM command because it uses a menu-assisted, full-screen definition process.

DELETE—In *dBASE III*, the *dBASE II* DELETE FILE command has been officially replaced by the ERASE command, but the old construction still works.

DIR—In *dBASE III*, this command, which displays names of files on a specified disk drive, implements the DOS 2.x PATH command structure. However, the old *dBASE II* syntax, DISPLAY FILES LIKE, can still be used.

DISPLAY—In *dBASE III*, this command can handle Memo and Date fields and displays records a screen at a time, not just 15 records.

DISPLAY MEMORY—In *dBASE III*, this command shows the public or private status of variables and both the display and internal value of numeric variables.

DISPLAY STATUS—The *dBASE III* version of this command provides more information on active database and index files and other system parameters than the *dBASE II* equivalent.

DISPLAY STRUCTURE—The TO PRINT clause in *dBASE III* sends output to the printer.

DO—The *dBASE III* command uses a

WITH clause to pass parameters to the called program and can call a subprogram from an activated Procedure file.

DO WHILE—In *dBASE III*, macro statements cannot be used in a DO-WHILE statement but can be used within the body of a DO-WHILE loop.

EDIT—In *dBASE III*, this command modifies stored data on a full-screen and does not require a record number. It can also handle Memo and Date fields.

ERASE—In *dBASE III*, this command deletes a specified file like its *dBASE II* equivalent DELETE FILE. The *dBASE II* ERASE command clears the screen.

INDEX—In *dBASE III*, this command permits use of Date fields in its index.

INSERT—In *dBASE III*, this command permits use of Memo and Date fields.

JOIN—The *dBASE III* syntax has been modified to use multiple work areas.

LIST—In *dBASE III*, the TO PRINT clause sends output to printer.

MODIFY COMMAND—In *dBASE III*, the built-in full-screen text editor/word processor is more flexible and is better integrated.

MODIFY STRUCTURE—In *dBASE III*, this command does not erase existing data when structure is modified, with certain exceptions.

QUIT—In *dBASE III*, the RUN command replaces *dBASE II*'s QUIT TO option.

READ—*dBASE III* offers no NOUPDATE option.

?—The *dBASE II* equivalent to this command, which displays characters on an output device, is REMARK.

REPLACE—*dBASE III* offers no NOUPDATE option.

REPORT—In *dBASE III*, this command, which displays columnar reports defined with the MODIFY REPORT command, is more flexible.

RESTORE—*dBASE III* provides a much larger pool of memory variables.

RETURN—In *dBASE III*, the TO MASTER clause returns the control to the highest-level calling program.

RUN—the *dBASE II* equivalent to this command, which executes DOS programs from within *dBASE III*, is QUIT TO.

SAVE—*dBASE III* provides an ALL EXCEPT clause in addition to an ALL LIKE clause.

SELECT—*dBASE III* offers ten simultaneously available work areas versus two in *dBASE II*. Alias names can be used in addition to the work area number.

SET XXXX TO—In *dBASE III*, new options for this command include: DECIMALS to set the number of decimal places displayed; DEFAULT to indicate the default disk drive; DELIMITER to indicate how field widths are displayed; DEVICE to indicate where @ commands will be sent; FILTER to filter out records not meeting specified criteria; FIXED to determine whether a fixed number of decimal places will be displayed; FUNCTION to program function keys; HEADING to toggle display of field names with LIST and DISPLAY commands; MARGIN to control the left margin of printed output; MENUS to control display of function key prompts; PATH to specify a search path for file search; PROCEDURE to open a procedure file containing up to 32 subprograms; RELATION INTO to link two independent databases according to a common key; SAFETY to control overwriting of files; and UNIQUE to control handling of records with unique keys.

SORT—The *dBASE III* command can sort on more than one key and is much faster. An undocumented /C option disregards both upper and lowercase.

USE—*dBASE III* provides up to ten work areas; alias and DOS 2.x path names can both be used.

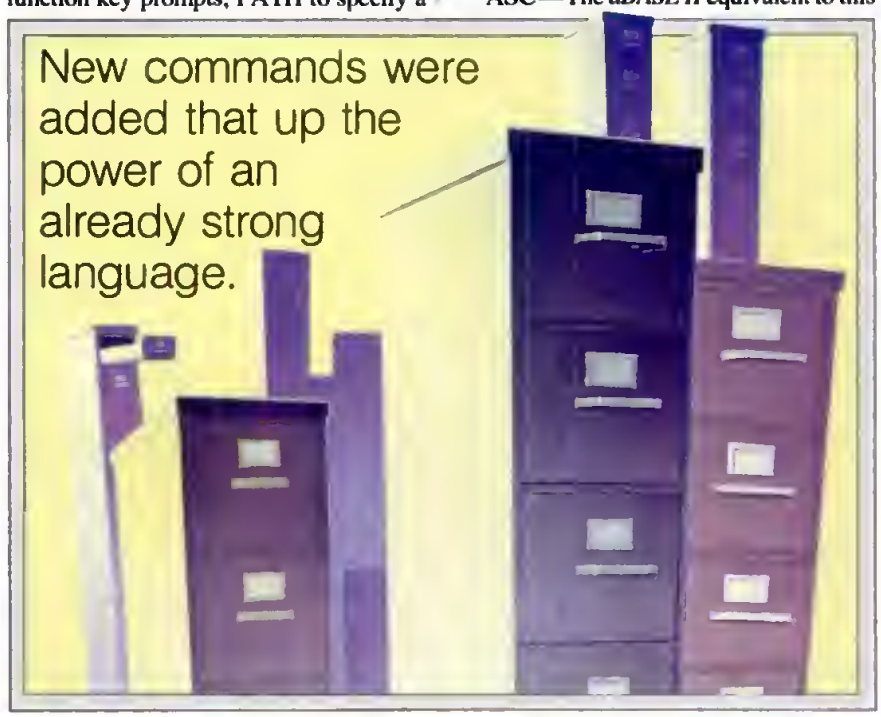
WAIT—In *dBASE III*, when the WAIT command creates a variable, a carriage return response stores a zero instead of a blank space.

ZAP—In *dBASE III*, this command is much faster than the DELETE ALL and PACK commands in *dBASE II* or *III*.

Function Comparison

&—In *dBASE III*, this macro substitution function cannot be used in a conditional part of a DO-WHILE statement.

ASC—The *dBASE II* equivalent to this



function, which returns the ASCII code value of the first character in a string, is the RANK function.

DATE—In *dBASE III*, this function gets the system date from DOS.

DELETED—the *dBASE II* equivalent to this function, which identifies records that have been marked for deletion, is the * function.

EOF ( )—The *dBASE II* equivalent of this function is EOF.

RECNO—The *dBASE II* equivalent to this function, which returns the current record number, is the # function.

SUBSTR—The *dBASE II* equivalent, which extracts a specified part of a character string, is the $ function.

UPPER—The *dBASE II* equivalent, which converts lowercase characters to uppercase, is the ! function.

New Commands

The following *dBASE III* commands and functions have no equivalent in *dBASE II*.

ASSIST—A menu-driven operation aid designed for interactive commands by beginners.

AVERAGE—Computes arithmetic mean of expressions for all or some of the records in the active database.

CLOSE—Closes specified files. It can close database, alternate, format, index, and procedure files. It does not affect memory variables.

COPY FILE—Copies any type of file.

CREATE LABEL—Creates or modifies a label format file. This command is identical to MODIFY LABEL in *dBASE III*.

EXIT—Exits from a DO loop and continues with the next statement after the loop.

LABEL—Prints labels using a predefined label form file.

LOG—Returns the natural logarithm of a number.

MODIFY LABEL—Creates or modifies a label form using a full-screen definition process.

MODIFY REPORT—Creates or modifies a report form. This *dBASE III* report generator is more flexible than the one in *dBASE II* and uses a menu-assisted, full-screen definition process.

PARAMETERS—Assigns local memory variables names to data items that are passed from a calling program with a DO-WITH statement.

PRIVATE—Hides variable definitions from called (lower-level) programs. It is similar to local variables in other high-level languages.

PROCEDURE—Identifies the beginning of each subprogram in a procedure file (which is invoked with the SET PROCEDURE TO command).

PUBLIC—Declares a memory variable as available to all called programs, much like the global concept in other high-level languages. It is not released by the autoreleasing mechanism at program termination.

SEEK—Positions pointer to the first record with an index key that matches a specified expression, similar to FIND.

TYPE—Displays or prints the contents of a text file.

New Functions

BOF—Indicates the beginning of a database file.

CDOW—Character day-of-the-week function that returns a character string containing the day of the week when given the day number.

CMONTH—A character month function that returns the character name of any month when given that month's number.

COL—Returns the current column position of the screen cursor.

CTOD—Converts a character string date to an internal date variable.

DAY—Returns the numeric value of the day of the month from a date variable.

DOW—Returns a number corresponding to the day of the week (Sunday = 1).

DTOC—Converts a date variable to a character string variable.

EXP—An exponential function that returns *e* to the xth power.

LOWER—Converts uppercase characters to lowercase.

MONTH—Returns a number representing the month from a date variable.

PCOL—Returns the current column position of the printer.

PROW—Returns the current row position of the printer.

ROUND—Rounds numbers to a specified number of decimal places.

ROW—Returns the current row location of the screen cursor.

SPACE—Creates a character string containing a specified number of blanks.

SQRT—Returns square root of a positive number.

TIME—Returns the system time as a character string.

YEAR—Returns the complete numeric value of the year from a date variable.

Documentation

Ashton-Tate has clearly expended a lot of effort improving the documentation for *dBASE III*. The new manual is beautifully written and nicely typeset. Screen output is shown in green insert boxes, which is a good way of showing what the program will produce without cluttering up the manual with pseudo-screen images. The manual has an excellent table of contents, index, and tabs for easy reference. An extended sample accounting suite is in the manual and on disk.

The *dBASE II* manuals have always had difficulty reconciling the different needs of beginners and advanced users and programmers. While the *dBASE III* manual still includes a tutorial for beginners and reference sections for the more sophisticated, the entire manual is appropriately written for both of these audiences—the simpler sections don't talk down to you and are informative even for the advanced, while the reference sections

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are quite clear and easy to grasp. A helpful ringbound *Quick Reference Chart* is also included.

Conversion

The tremendous speed advantages of *dBASE III* alone make it a much more desirable environment than *dBASE II* for complex systems. With all the syntax changes, new commands, and deleted commands, is the process of converting existing programs from *dBASE II* to *dBASE III* a big job?

The answer is a resounding "It depends." Ashton-Tate has included a conversion tool called *dCONVERT* that can automate much, but not all, of the conversion process to *dBASE III*. Its ability to handle the conversion depends on many factors, including how straightforward the *dBASE III* program is, the programming techniques and styles used, *dBASE III*'s quirks, and more.

A nicely written guide to *dCONVERT* by Adam Green, a well-known *dBASE* trainer, is also included. It discusses the differences between *II* and *III* (the main manual doesn't even mention *dBASE II;* Ashton-Tate is serious about considering *dBASE III* a separate product rather than an upgrade of *II*) and includes useful suggestions on using the new capabilities and style of *dBASE III*. The guide also indicates the situations in which *dCONVERT* can manage a translation automatically and those in which you will have to step in manually.

dCONVERT handles many of the simple syntax changes automatically. For example, EOF() is inserted for EOF, DELETED() for *, and so on. Even some of these simple conversions can be troublesome; *dCONVERT* will change # to RECNO(), which is usually right, but if you used # as a "not equals" symbol, an error will result.

More troublesome are logic changes dictated by the way *dBASE III* works. Several significant changes require recoding a *dBASE II* program into *dBASE III*. For example, when a FIND command is unsuccessful, *dBASE II* sets the current record number to 0; the *dBASE II* test for a NO FIND command is then IF # = 0. In *dBASE III*, however, a NO FIND command sets the RECNO() pointer to the bottom of the file and sets the EOF() flag. Another example is the way *dBASE III* treats carriage returns as input to ACCEPT or WAIT statements. *dBASE III* treats such input as a null, or zero length, string, while *dBASE II* assigns a single blank to a carriage return response. The code changes necessary to handle this difference are not major, but *dCONVERT* can't do it for you.

With all the syntax changes, new commands, and deleted commands, is converting existing programs from dBASE II to dBASE III a big job? The answer is a resounding "It depends."

The new automatic scoping provisions of *dBASE III* can lead to many problems to which *dCONVERT* is oblivious. The parameter-passing ability and PUBLIC and PRIVATE statements are real advances in allowing modular program development without side effects, but they can lead to some nasty surprises when converting *dBASE II* program systems. It is not particularly difficult to recode the necessary statements, but it is cumbersome and time consuming.

dCONVERT can be run directly from DOS, in which case "wild card" symbols can be used to convert an entire batch of files. The program indicates its progress by displaying dots as blocks of code are converted—a considerate touch—and displays when programmer conversion will be required. Unfortunately, this assessment is made from *dCONVERT*'s point of view, so programs that *dCONVERT* says are "100 percent converted" will often need either a little or a lot of additional manual conversion.

The converted program includes comment lines, beginning with *!!, that tell you what *dCONVERT* has done. This provision is also sometimes inconsistent; *dCONVERT* changes some things without any message.

dCONVERT also converts DBF, FMT, MEM, and other files. Data files must be converted because *dBASE III*'s header is larger (to accommodate the greater number of fields, added data types, and so on), and the form of MEM files and NDX files is different as well. *dCONVERT* doesn't actually convert NDX files, but it produces a one-line program file that you run under *dBASE III* to produce a new index.

To investigate the difficulty of converting from *dBASE II* to *dBASE III*, I first converted a reasonably simple database system, prepared for an engineering client, that stored information on plot locations. This program system included eight separate program modules and was written in reasonably standard *dBASE II* (no arcane constructions or tricks). The data file contained about 1,000 records.

The conversion proceeded smoothly and quickly. *dCONVERT* reported that all the modules were translated with no programmer conversion required. When I ran

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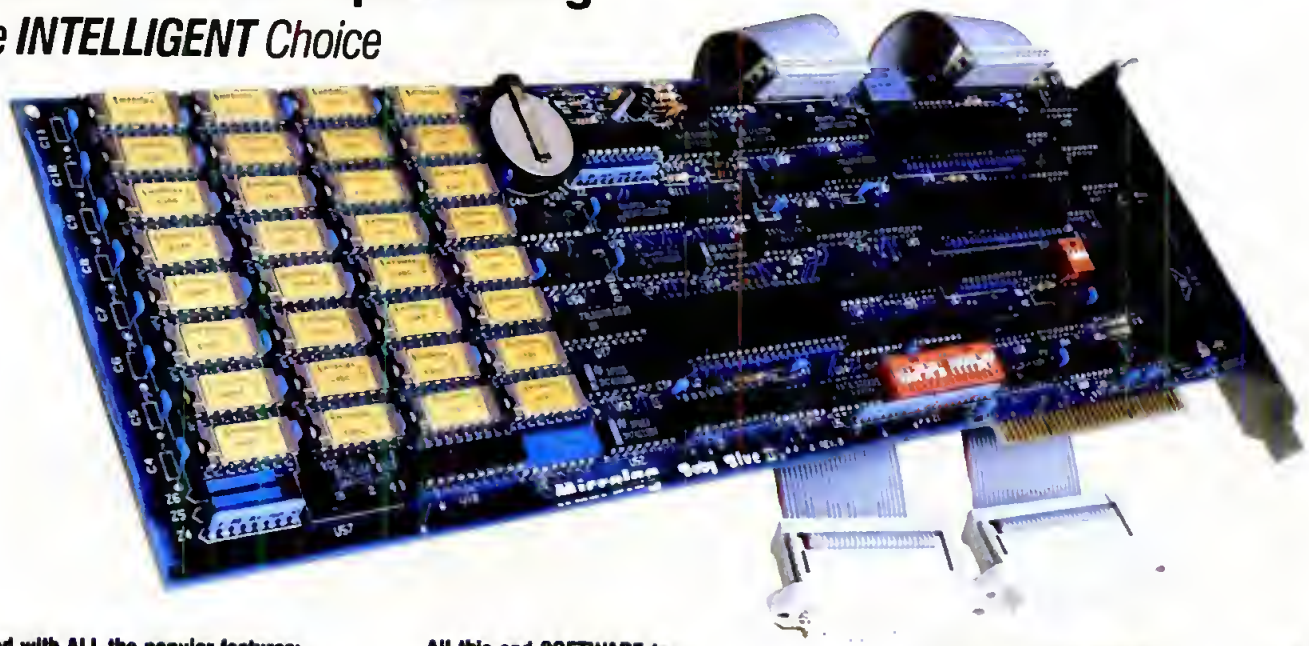

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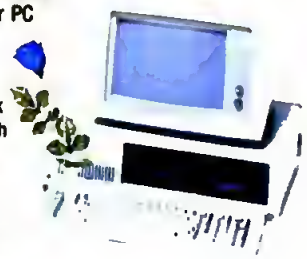

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the converted *dBASE III* system, everything worked until the program executed some subprograms. *dBASE III*'s automatic release of memory variables repeatedly stopped the program, because variables that had been created in the subprograms and that were subsequently used in a higher-level module no longer existed.

Fixing this problem took only a few minutes. The fix can be "patched" in by declaring the culprits as public before they are initialized. A better method is to declare all such variables that are needed throughout the system as public in the highest level module.

> Ashton-Tate has included a conversion tool called dCONVERT that can automate much, but not all, of the conversion process.

All in all, converting this system to *dBASE III* took less than an hour and was almost painless. The *dBASE III* version ran faster than the old version, particularly when sorting or, to a lesser extent, indexing was required. The conversion was definitely worth the limited amount of time required.

Next I decided to take on a more ambitious task. I converted a complex customized mailing list management system prepared for another client. The *dBASE II* version was over 3,600 lines of code in 22 program files and occupied over 100K of program storage. I had used many advanced techniques and tricks to make it both flexible and easy to operate.

dCONVERT itself took less than a half hour to convert the entire program, as well as the format and data files. As with the simpler package, it then reported that all the programs were converted 100 percent. As I expected, this statement did not turn out to be true. Many of the trickier constructions had to be modified manually, but the task ultimately turned out to be rather straightforward. The more I worked with *dBASE III*, the easier the process became. After only a short while, I began to modify sections of the code that were able to work under *dBASE III* but that could be made more logical or efficient with the new system.

Interestingly, some *dBASE II* constructions that, according to the manual, should not work under *dBASE III* were not translated by *dCONVERT* and, in fact, worked as they did under *dBASE II*. For example, the statement DISPLAY FILES LIKE *.NDX should be changed to DIR *.NDX, but the old statement worked as expected anyway. Even more surprisingly, a few compound statements with macro expansions in a DO-WHILE loop seemed to work as expected. A note in the *dBASE III* manual takes great pains to explain that macros can not be used in *dBASE III* control statements because they would slow down the system by up to 30 percent. Some research revealed that my logic was faulty; the macro portion of the compound DO statement was not needed for correct operation.

Nonetheless, *dCONVERT* does not flag macros in DO-WHILE statements; it continues to report 100 percent conversion with no alterations necessary. This result is clearly wrong, but the problem in *dCONVERT* should not be hard to correct.

The balance of the conversion involved exactly the kinds of logic changes covered by Green in his explanation. None was terribly complex and the entire system was modified in less than one long work day, even with revisions and enhancements to program operation that occurred to me as I waded through the program files. The system ran noticeably faster and more smoothly under *dBASE III*. I am not sure this particular client would quickly recoup the cost of conversion if it were paying my normal rates for such work, but other systems I have written—that do sorting, work around *dBASE II*'s field limitations through complex tricks, or would run better with more than two files open at once—would benefit more. The added speed (and reduced delays) of *dBASE III* would probably result in cost reductions that would clearly justify the conversion expense.

Summary

As lengthy as this evaluation has been, it still hasn't been able to delve fully into *dBASE III*. Like its predecessor, *dBASE III* is a big, complex program that has tremendous flexibility and power. It takes a significant investment to learn its intricacies, but it can be used quickly and relatively painlessly even by novices.

While *dBASE III* is far from perfect, it is unquestionably far better than its predecessor *dBASE II*. The price differential between the *II* and *III* versions for the PC is minor given the cost of learning the system and the dividends *dBASE III*'s faster execution will pay.

When bombarded with publicity extolling the virtues of such integrated software systems as Lotus's *Symphony* and Ashton-Tate's own *Framework*, you should remember that the database capabilities built in to these integrated packages is very limited indeed. You'll need the power of *dBASE III* if you must do any serious data management. *dBASE III* represents an honest advance in the microcomputer database management state-of-the-art at a very reasonable price. ■

> Like its predecessor, dBASE III is a big, complex program with enormous power that can be used relatively painlessly.

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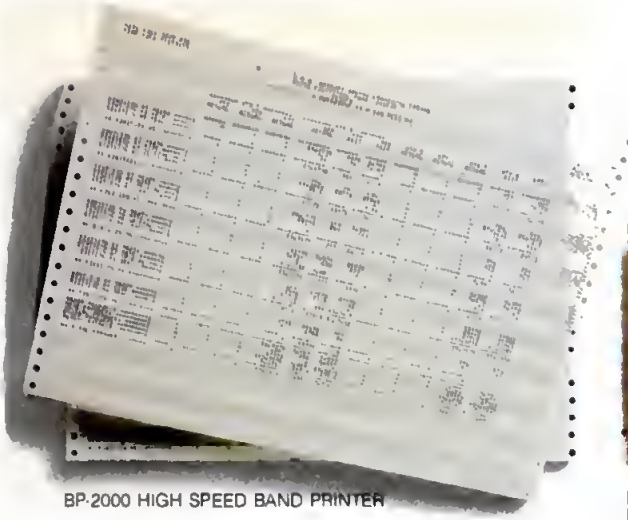

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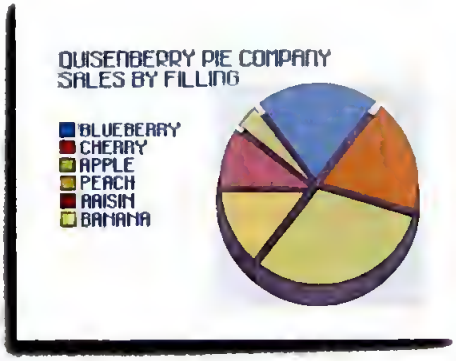

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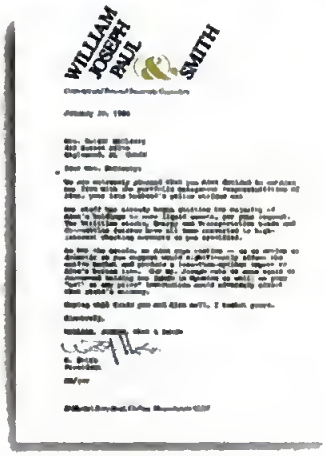

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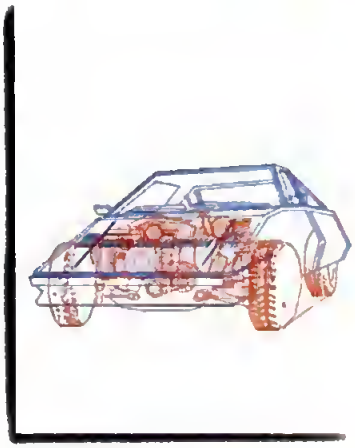

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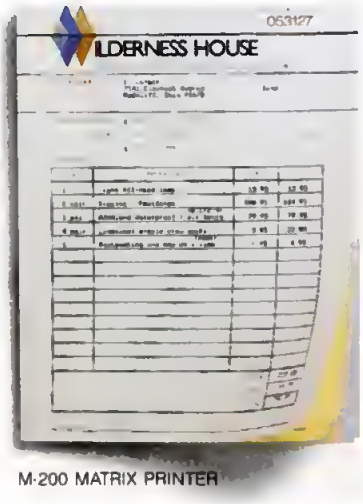

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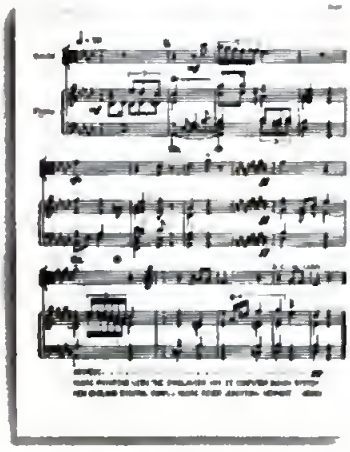

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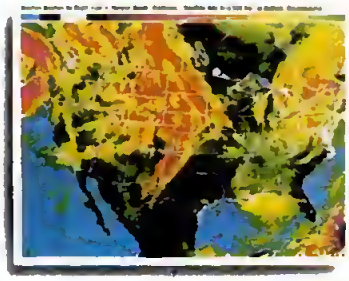

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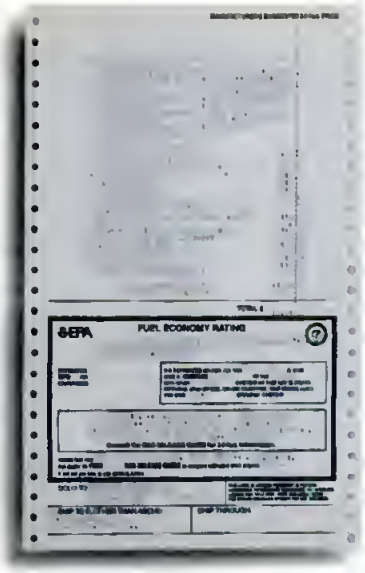

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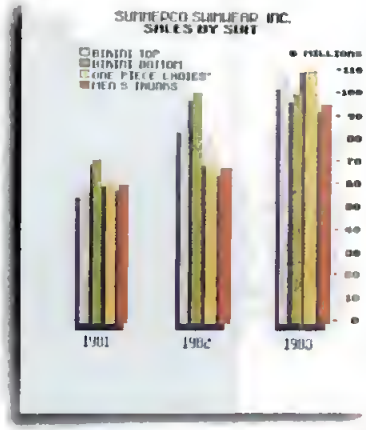

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M-100L
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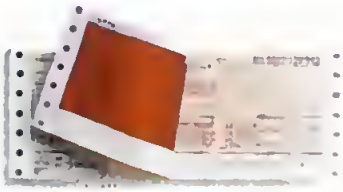

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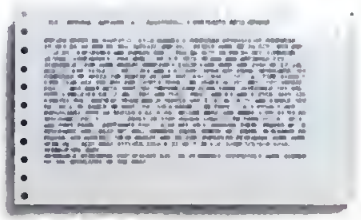

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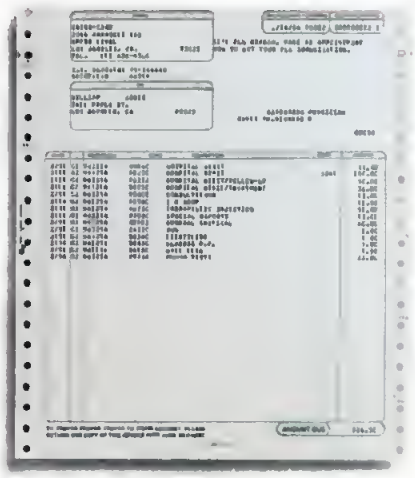

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CBS Makes News with PCs

Four PCs in Dallas gave Dan Rather's memory a boost during the Republican Convention. Tied to computers in New York, they helped the network's correspondents get information instantly.

The canned hysteria of the Republican convention in Dallas last summer was a journalist's headache. At the Democratic powwow in San Francisco, Geraldine Ferraro gave the news hounds plenty of copy to file. But in Dallas, the reporters were aching for stories.

The CBS correspondents stationed in the network's three-tier election headquarters on the convention floor at first glance seemed no better off than the reporters who flashed as many press badges as there were Reagan for President buttons and American flags. Along with the two other major networks, though, CBS had an edge. A news source kept them up-to-date on developments with the delegates. In fact, it helped them generate enough story ideas to enliven their nightly coverage of this drab political affair.

The source of all this information was stored behind the slick, blue CBS tower, in an inconspicuous white trailer. There, four IBM PCs, tied to CBS mainframe and minicomputers in New York, offered access to over 12 years of political files and

a comprehensive database covering all the delegates on the GOP convention floor. The seven-person research staff at the PC keyboards generated enough story ideas and accessed enough data to keep Dan Rather spouting facts about the delegates, the candidates, and the Grand Old Party. To viewers, Rather seemed to have either the memory of an elephant or a mile-long cue card.

In fact, during the convention's opening ceremony, a CBS correspondent asked one of the researchers about the delegate mix. The researcher punched out the story at the IBM PC keyboard, even though the PC's disk drive held no software. A box of *DisplayWrite 2*, along with Lotus's *1-2-3* and several boxes of the language processor STSC APL*PLUS/PC, sat on the nearby desktop. The word processor he was using was contained in the research unit's DEC PDP-11 mini at its New York headquarters. His story automatically became part of the CBS News delegate database.

Mainframe Access

At one point in the story he needed some details on the percentage of delegates who were white males. He passed the request to Richard Silverman, deputy director of the election and survey unit of CBS News. Using the APL*PLUS/PC software package, the appropriate keycap labels, and a Hayes 1200B modem, Silverman accessed the New York IBM 370 mainframe in minutes. This mainframe, which also handles all corporate accounting work for CBS, held the results of the CBS News survey of the 2,235 Republican delegates who were raising hell in the Dallas convention hall. The requested information immediately appeared on screen: 51 percent of the Republican delegates were white males. Silverman passed it on to the writer, who punched out the rest of his story.

With the corporate mainframe on-line, Silverman then demonstrated how the database management, analysis, and communications program he had constructed with APL could tap into the CBS data center mainframe from 1,500 miles away. With the information it accessed, CBS News could generate dozens of story ideas for the anchor desk. The anchors in turn could offer their on-the-spot analyses based on solid data, like that from the CBS News survey.

Within minutes, CBS found that 45 percent of the delegates had annual incomes in excess of $50,000.

From this survey, the staff researcher at the PC had also learned that four delegates were planning to withhold their votes from the Reagan/Bush ticket. The researcher passed on the names of those delegate-anomolies to a correspondent covering the floor. The news-starved reporter had been hungry for just that kind of substantial lead.

Earlier that summer at the Democratic convention in San Francisco, a similar search of the research unit's 1976 delegate survey discovered that one delegate had then voted for Mondale for president. CBS immediately contacted the delegate for a follow-up interview to see if he had changed his mind. (He hadn't.)

When the research staff was not retrieving information in Dallas and San Francisco, they toured the convention floors with Radio Shack Model 100s, updating the 2-week-old data on the delegates from the CBS News survey. They would then transmit it to the New York database.

Silverman was able to tabulate the delegate information his staff had collected in any way he might desire. Within minutes of one query made in Dallas, he found that 45 percent of the Republican delegates had annual incomes in excess of $50,000.

The APL*PLUS/PC software the staff used to cover the conventions was the same they use for their ongoing opinion polling and analyses, conducted in conjunction with the *New York Times*. "Our political researchers are working all year round just keying in information, writing reports, creating handbooks, and answering questions," Silverman said. "We just don't come out of the woodwork at election time."

The CBS corporate mainframe accesses surveys that the CBS News research unit has been conducting since 1972. But 1984 was the first election year that CBS replaced its "dumb" terminals with IBM PCs at the convention sites, eliminating the costly leased phone lines between the conventions and New York. "At CBS there is a growing acceptance that you can't cover an event of this complexity accurately without computers," Silverman, a 14-year CBS veteran, explains. "I have been at CBS long enough to see people's attitudes change from 'things were better in the old days' to a real acceptance that 'if we didn't have computers, we wouldn't have as good a broadcast.' "

The configurations of the four IBM PCs that Silverman had installed in the research unit trailer in Dallas all included green monochrome screens and 512K of memory. Each was attached to an IBM graphics printer; one NEC 3550 letter quality printer was on hand for correspondence. And although seven PCs had been on the floor of the Democratic convention at San Francisco's Moscone Center, the four machines in Dallas were able to handle the same basic tasks.

In addition to the mainframe-based delegate survey, the general CBS News political database was a prime source of convention trivia and information for broadcast. This database is on the research unit's New York DEC mini.

When Geraldine Ferraro's name was placed into nomination for vice-president at the Democratic gathering, reporters from all corners of the convention hall dashed madly to gather details about her

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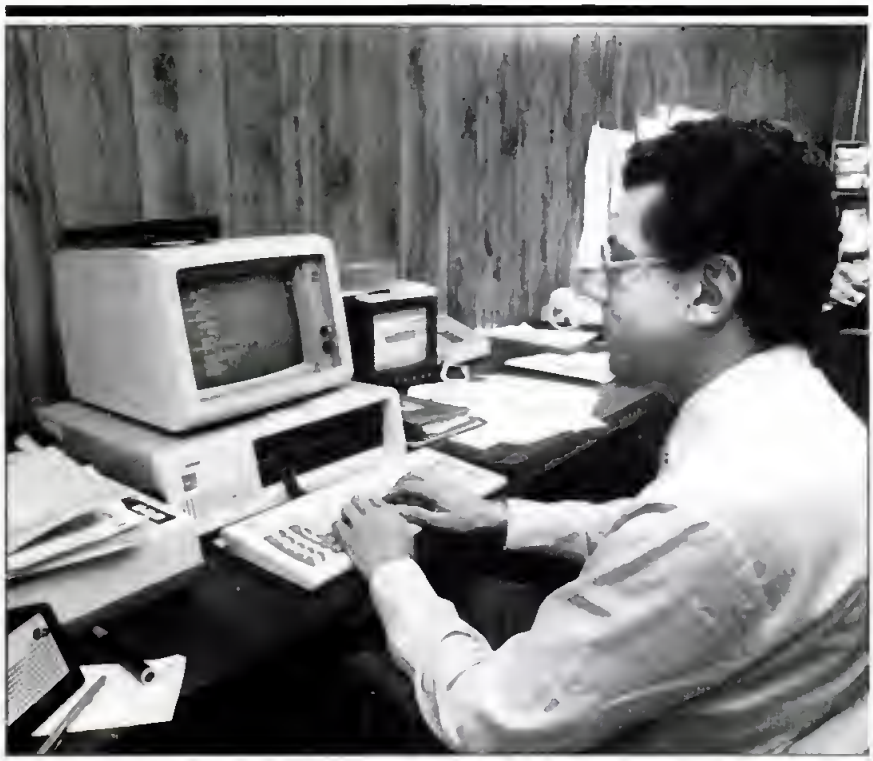

CBS researchers punch queries into PCs linked to the CBS News political database.

family and her career. Many ran to Nexis terminals planted in the news rooms that were pitched behind curtains adjacent to the convention floor. (In Dallas, Nexis exhibited this database library to all, demonstrating software that allows you to link an IBM PC to their service.) CBS correspondents, however, ran to the network's researchers, who simply punched their queries into PCs linked to the CBS News political database in New York. Printouts of all pertinent information about this representative from Queens were on the correspondents' desks within minutes.

CBS News stores its political database on the research unit's mini, as opposed to on the corporate mainframe, for precisely such times as that, when they need information immediately. For the same reason, Silverman adopted a long-term strategy for election coverage—to transfer as much computer power as necessary to the convention site. As he explains, "We used to handle most of our functions from the mainframe. This wasn't an ideal way of doing things because we were relying on the response time from a computer that is doing other things that we can't control." Silverman sees the trend to more computers at the news sites increasing, aided by IBM's new AT line.

The Chyron Connection

One of the more interesting applications of the IBM PC at last summer's political confabs involved tracking convention roll calls in action and then generating the numeric results for broadcast on national television. Alongside one of the PCs in the Dallas research trailer, a stacked pair of television sets were tuned to the CBS broadcast. A loudspeaker that tapped into the network's radio pool also blared the proceedings. When a roll call was taken, these sources alerted a PC operator, who keyed in the results as they were announced. The software followed a menu-driven listing of states (in the order they were scheduled to be called) and automatically tabulated a running total. It also calculated the number of abstaining delegates. That PC was attached by cable via an RS-232 connection to the CBS broadcast center beneath the convention floor, where the computer instructions set into motion the text and color capabilities of an $80,000 character generator manufactured by Chyron. The roll call results that originated at the IBM PC terminal were broadcast with more clarity and dimension than any unassisted IBM PC color/graphics board could offer. The procedure could easily be compared to a Toyota pushing a bulldozer.

"We perform all the functions that an operator would perform at the Chyron keyboard, but at a much higher speed and with some degree of intelligence," Silverman said. "We're taking advantage of the PC's computing ability and the fact that it can react much faster than a human operator when it comes to making changes and tabulations on the spot." But Silverman made sure that it was clear that CBS is not producing the graphic information with the PC. "We're just supplying the character generator with the information."

Silverman demonstrated what the PC-Chyron connection could do by punching up the roll call file on APL. He could reverse the order of the candidates on the screen or show percentage totals within one decimal point accuracy. Convention rules allow states to defer to others or pass during roll calls; the program is able to cope by inserting any state at any time. It can handle all the alphanumeric maneuvering live, on the air. The richly colored numbers you saw flashing on your TV when Reagan and Bush were nominated with a single roll call last August passed through a PC in Silverman's research unit.

Despite the potential of this PC application, it may become obsolete. Today's conventions don't hold many surprises during roll calls. Moreover, roll calls are becoming less and less frequent. The 1984 Democratic conclave had only two, of which only one (that for President) was

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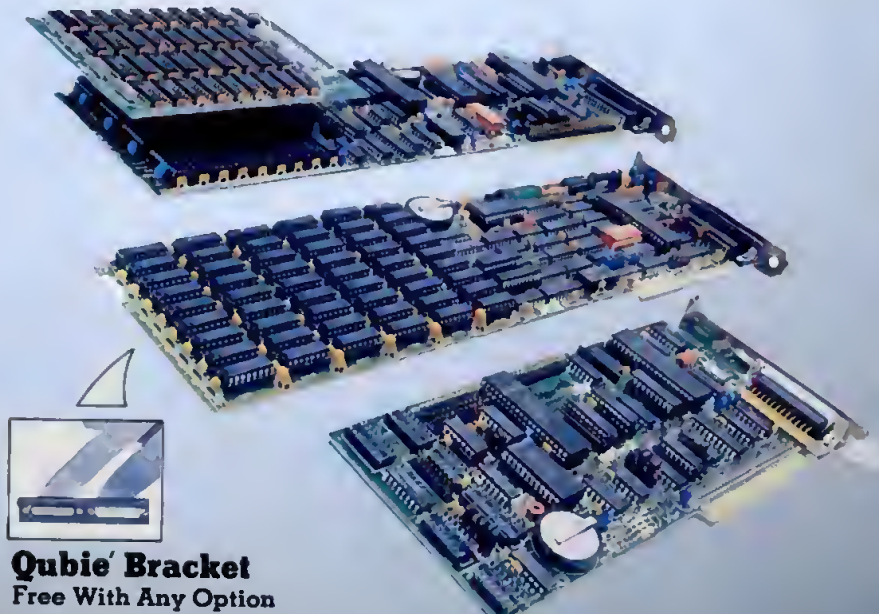

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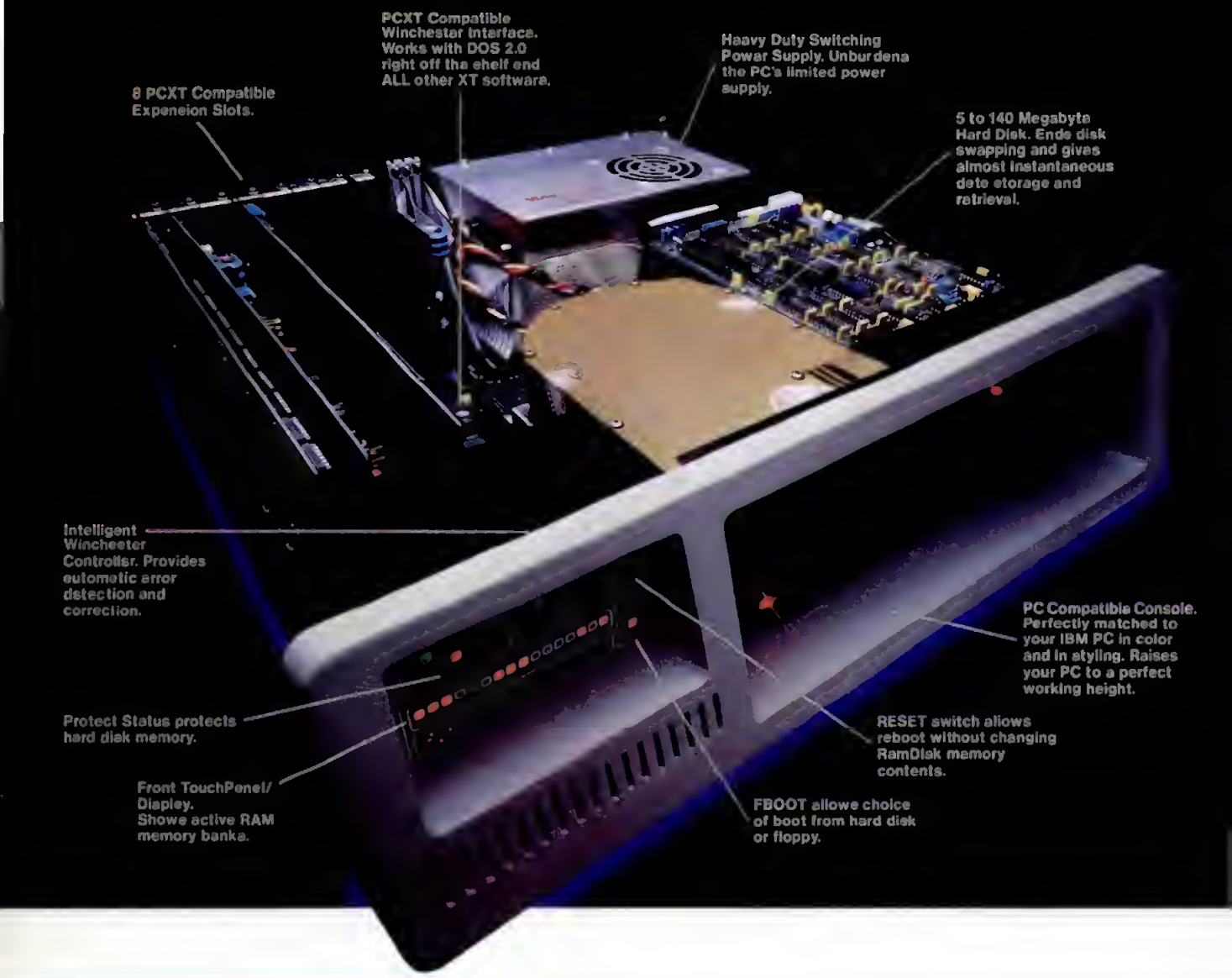

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aired. The Republican convention held only one roll call.

As a result, the excitement of convention coverage these days can best be described as "low key." If anything, Silverman maintains, the conventions are "warm-ups for the real thing."

One Chance

The real thing is always the election itself. And on election eve there are generally plenty of upsets, surprises, and one overriding rule: nothing can go wrong, since, as Silverman explains, "In live broadcasts you get only one chance."

As a result, at CBS, as at all the networks, a great deal of tension accompanies the event. The research staff and the correspondents follow hundreds of state and federal elections, using the staff's PDP-11 as well as the corporate mainframe.

> IBM doesn't want some announcer to say that the returns have been disrupted because of a problem with the computer.

In fact, for election night, IBM's media sales force in New York set up a special election unit designed to back up and supply hardware for each of the major network's news coverage units. As Silverman explains, "IBM doesn't want some announcer to say on nationwide television that the returns have been disrupted because of a problem with the computer . . . even if that computer isn't an IBM."

At CBS News IBM computers play a very important role. For election coverage, PCs do double duty as DEC terminals with VT 100 emulator software. The 3270 terminals are on each correspondent's desk; they even circle the election newsroom set. In fact, computer screens are projected on the backdrop of CBS's set by a Panasonic projection TV with RGB inputs, driven by IBM PCs also locked into the corporate mainframe tallies.

At the time of the Republican convention last summer, Silverman even considered planting a PC 3270 in front of anchorman Dan Rather. He thought Rather himself, not just the researchers, should have been able to access information immediately—on the air—via any one of the 24 function keys. Silverman also wanted him to be able to refer to multiple tables and returns at the same time with the PC 3270's windowing capability.

Future Plans

Silverman, it seems, is always making technical plans of this sort or solving hassles with high-tech means. His job includes everything from designing the computer system for election eve to helping *60 Minutes* columnist Andy Rooney connect his Radio Shack Model 100 lap computer to a printer. Computer graphics with the DEC mini is his latest pursuit. With this election year nearly over, he and his staff are already eyeballing new technology for the elections of 1986 and 1988.

Silverman's stint in Dallas for the Republican convention coincided with IBM's news-making announcement there, introducing the PC AT to its dealer force. He witnessed a demonstration of the new product line, which impressed him so much that he expects the AT to play a significant role in the CBS surveys and in the network's election coverage in the coming years.

What technical changes is Silverman considering for CBS News to use in its coverage of the 1988 convention and elections? "In politics you pick a president every 4 years," he responds. "In computer technology things move much faster: 1988 could be several generations away." ■

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CIRCLE 131 ON READER SERVICE CARD

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You've heard the buzzwords: user friendly, integrated, smarter, faster, cheaper. But when you push the rhetoric aside you're still asking the same question, "Why can't I get a system that solves more problems than it creates?"

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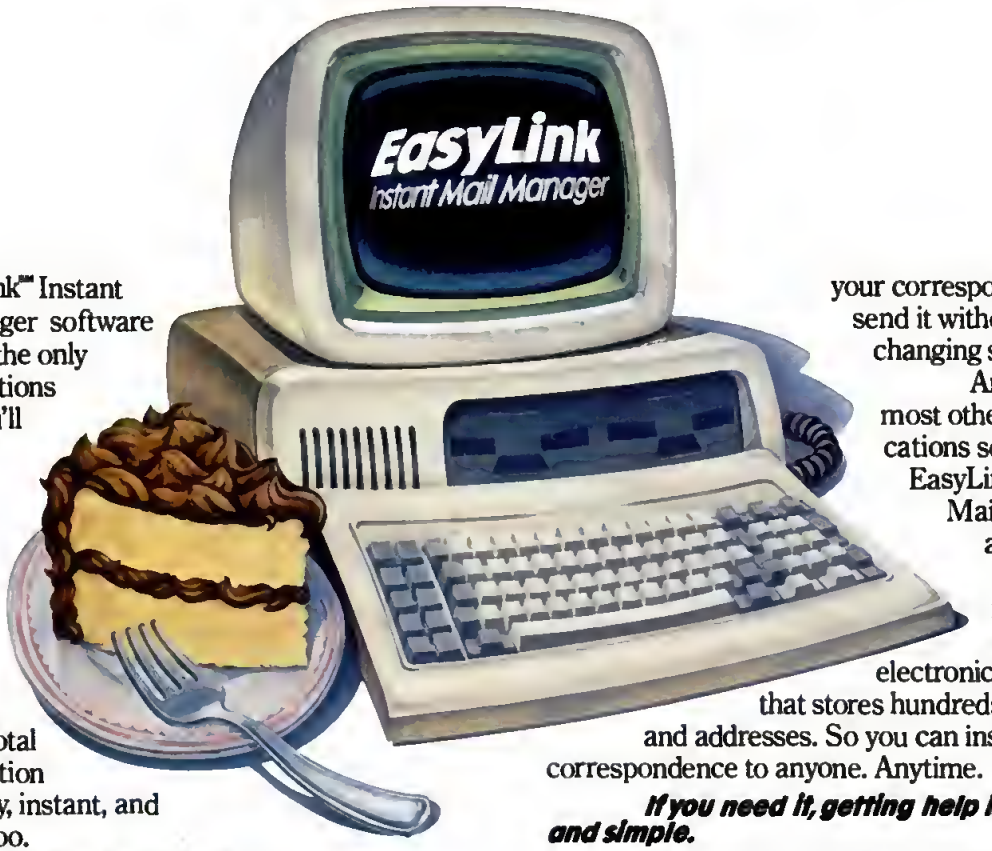

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All the right ingredients.

EasyLink Instant Mail Manager works with EasyLink service to provide automatic access and transmission of almost any type or length correspondence over the EasyLink network. So sending mail instantly to virtually any other phone-equipped PC or word processor is a snap.

You can even reach people without equipment. Thanks to EasyLink's instant access to Western Union's Worldwide communications services.

EasyLink Instant Mail Manager also lets you access your company's computer or connect instantly to other business and information services.

The frosting on the cake.

EasyLink Instant Mail Manager is more than simple "send and receive" software. With it, you also have complete word processing capabilities. So you can easily create, edit and change the format of your correspondence, then send it without ever changing software.

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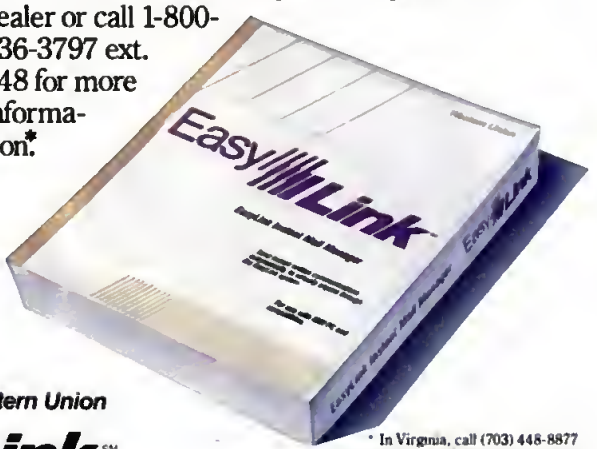

Western Union EasyLink℠

* In Virginia, call (703) 448-8877

Software by Kensington Microware.
Available for the IBM PC, and compatible equipment.

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CIRCLE 240 ON READER SERVICE CARD

PROJECT MANAGEMENT WITH THE PC

Graphics: Chris Spollen

Project management, as most business people know, concerns the management of resources and environment to reach a specific goal. Project management software programs are designed to help users handle large and/or multiple projects more easily. These programs seem to increase in number daily.

We divided project management software programs into three categories for our overview: Level I programs offer one or more planning facilities for taking a first look at a project and sizing up the work that will be needed; Level II programs, also capable of progress reporting, can generate status reports; Level III programs allow you to coordinate several projects that share resources.

Surprisingly, approximately two-thirds of the 35 packages included in our overview are Level I programs—too many to include in one issue. So this second part of our three-part series on Project Management software covers the remaining 12 Level I packages.

THE CONFIDENCE FACTOR: DECISION MAKER'S TOOL KIT

FACT FILE

The Confidence Factor, Version 2.0 B
Simple Software Inc.
2 Pinewood
Irvine, CA 92714
(714) 857-9179
List Price: $389
Requires: 128K RAM, two disk drives.

CIRCLE 789 ON READER SERVICE CARD

The Confidence Factor is billed as a "decision maker's tool kit" by Simple Software Inc., and for once I've run across a program that lives up to its manufacturer's claims. "Tool kit" implies that a variety of programs designed to handle a spectrum of needs is included in the package. In fact, *The Confidence Factor* includes seven functions to help managers make decisions, evaluate alternatives, track projects, and perform other useful tasks. Its main event is the flexible Critical Path Method module, but its other modules are interesting too.

The Confidence Factor requires no installation other than making a backup copy for protection. The program runs equally well on floppy or hard disk systems. There is no tutorial, but helpful sample files are provided which help clarify the operation of each program module.

The manual states that *The Confidence Factor* is designed for managers with no computer expertise. I believe this assertion is essentially valid because the system is easy to run from a user-interface viewpoint. On the other hand, the system makes some major assumptions about what the user knows about rather arcane analytic management techniques. Many results are displayed for which no explanation is given. If you don't know the definitions of the terms *constraints* and *shadow prices* or what standard deviation means in the context of risk simulation, the documentation won't help. There are also a few minor bugs scattered throughout the program, primarily when moving from menu to menu (the menus don't return when they are supposed to). However, the program runs well in general.

DECISION SUPPORT MODULES

The non-CPM modules include Decision Trees, for evaluating and making tactical decisions; Best Alternative, for structuring and ranking the issues that affect a decision and reaching a conclusion; Risk Simulation, for predicting results; Linear Programming, for finding the optimum approaches to complex decisions; Best Course of Action, for determining the optimal choice among possibilities; and Yes/No Decisions, for ranking clear alternatives. Most of these modules use a spreadsheet-like matrix to input data, with full control over cursor position for easy entry and editing. Several employ the concept of successor events to indicate what occurs after an event. The syntax is not explained well in the manual, especially for more complex scenarios, but the method can be figured out after a while.

To some degree, the greatest benefit of using *The Confidence Factor* is the thought that you must put into defining the factors that have an impact on a decision and ranking their priority. *The Confidence Factor* assists in this process by forcing you to think these issues through thoroughly before you enter data. The results appear almost immediately, and printouts can be easily generated. Also, work can be saved or recalled from disk for future use. Though some of the output is cryptic to the uninitiated, those familiar with the terms involved will be impressed.

UNUSUAL FLEXIBILITY

The Confidence Factor's CPM module offers unusual flexibility and includes several variables not covered by many competitive products at this level. Task data are entered on a matrix with fields for task title, prerequisite tasks (normally up to nine, but more if dummy tasks are used), duration, cost (direct costs, not manpower costs), and an early start date. *The Confidence Factor* works only in what it calls "time units": the printout does not indicate specific days, weeks, months, or whatever real dates or times you choose. This is a weak method and reduces the utility of the output.

● The Confidence Factor's *Gantt chart can be sorted in various ways, including latest-finish order.*

Once the task data is entered, *The Confidence Factor* moves to its manpower cost section. Up to ten human skills and a cost for each are defined in time units the user has selected. For example, if days are the unit being used, the cost for one man-day for each skill would be provided. *The Confidence Factor* then asks for detailed manpower requirements for *each* task in the project. This is a rather tedious entry process, but it makes you think out each and every task in the project.

IMPRESSIVE REPORTS

When all the information has been entered, *The Confidence Factor* immediately calculates factors such as the critical path, overall manpower requirements, and costs and then produces an impressive array of reports, including a Gantt chart, complete project data report, job cost report, start/finish report, resource allocation report, and a smoothing report. The Gantt chart is printed in primitive characters and can be printed on almost any printer that can be connected to a PC. The Gantt chart can also be displayed on the screen, but it is cumbersome to move around within a large chart. The manual doesn't explain the significance of any of the output, but an experienced project manager should either be able to understand the data output or figure it out.

The Confidence Factor is an impressive and useful planning tool. Its CPM facilities are generally good, and its other planning aids are nicely done. All in all, *The Confidence Factor* can do a variety of useful analyses for a reasonable price.

—Glenn A. Hart

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                    GANTT CHART IN LATEST FINISH ORDER                PAGE   2
                 LEMON COMPUTER INTRODUCTION

                                                TIME PERIODS
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 49 Find Seasonal DemandI              XXsssssssssssssss
 51 EvaIuate Media       I                XXssssssssssssss
 52 SeIect Name          I              Xssssssssssssssss
 54 EstabIish Prices     I                XXssssssssssssss
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 58 Select Media         I                Xssssssssssssss
 59 Design LabeI/Tmark   I              XXXXXXXXXXssssssss
 60 Funds Flow Forecast  I                  XXsssssssssss
 64 Set Up Equipment     I               XXXXssssssssssss
 65 Receive Raw MaterialI                XXXXXXssssssssss
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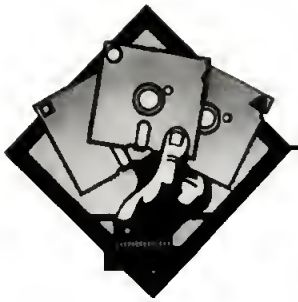


DECISION SUPPORT SYSTEM: HIGH-QUALITY GRAPHS

PC EXPERT PICK

Decision Support System
General Software Corporation
8401 Corporate Dr., #502
Landover, MD 20785
(301) 577-8775
List Price: $895
Requires: 256K RAM, one disk drive.

CIRCLE 793 ON READER SERVICE CARD

Whether *Decision Support System (DSS)* from General Software Corporation, of Landover, Maryland, even belongs in this project management series is a real question. The package does not perform most of the functions that the other evaluated programs do, such as calculating critical paths and estimating manpower requirements. Its high-quality graphs are its only redeeming feature.

BUYER BEWARE

GSC believes that any software tool that helps in the management of a project qualifies as "project management software," and, on one level, this view certainly makes sense. On the other hand, potential buyers of *DSS* should be careful to understand both its strengths and its weaknesses. GSC's promotional literature can be misleading until you understand what the system really does. Seeing nicely drawn PERT and milestone charts in its brochure might lead you to believe that the program actually does these complex calculations, but this is not the case.

DSS can produce 11 different types of project management charts: Milestone displays actual and projected dates for the completion of specific tasks; Organization represents interrelationships among the positions in an organization; PERT shows schedule order and accomplishment responsibility of project tasks; Earned Value Analysis monitors the cost performance of a contract or project; Trend Analysis plots cost variance and schedule variance; Resources compares actual versus planned labor or cost value; Bar/Line creates general bar/line graphs, primarily for labor/cost information on period and cumulative bases; Pie shows percentage breakdown of the components of a variable; Bullet creates topic outlines for presentations; N-Square shows the functional breakdown of a project and the interrelations of its subtasks; and Work Breakdown Structure shows the relationships among elements in a system.

DSS does some calculations, such as totaling cumulative charts and figuring variances, on a few of the charts but, for the most part, the user must have already used some other program to derive the inputs to *DSS*. For example, there is no way to calculate the critical path for a project. *DSS* has provisions to indicate the critical path, but you'll have to use some other program to determine it.

A POST PROCESSOR

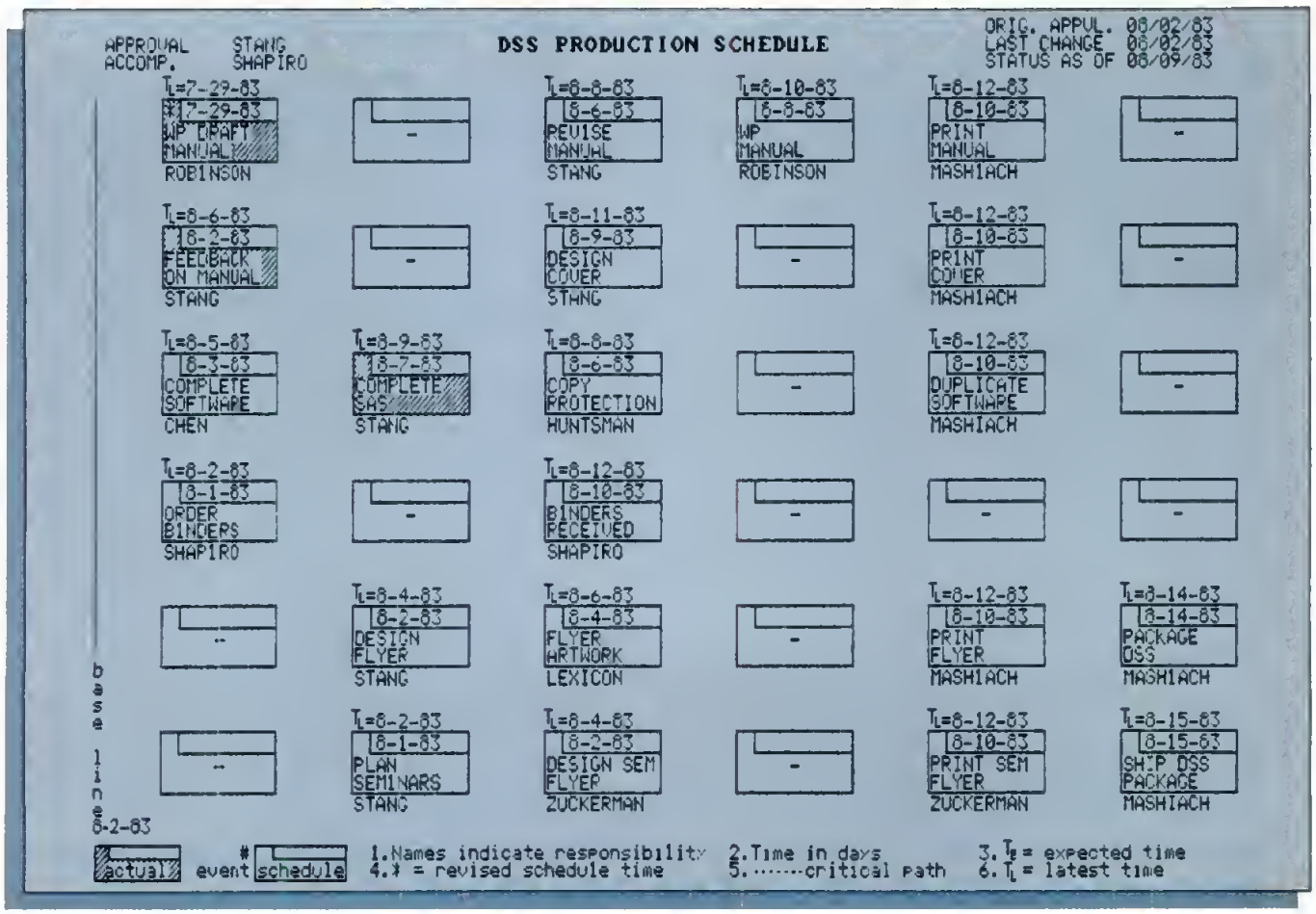
DSS can be considered a "post processor," which produces a higher-quality output from other programs. The graphs produced by this system are much better than those offered by many project management packages. Given this orientation, I think it is rather strange that *DSS* outputs to only a few dot matrix printers, including ones from IBM, Epson, and IDS, and not to plotters. The program can produce a special file that could be used by a plotter driver to produce high-quality output, but

no plotter drivers are supplied or are currently available. The matrix graphics are very good, but plotter output would be far superior. Printer output uses the GRAPHICS command of DOS 2.x, so current versions of DOS should be used.

DSS is supplied on 12 floppies, one for each of the chart types and a "Promate" disk that provides copy protection. All disks and files can be copied, but the Promate disk must be in a floppy drive to exit the system or produce hard copy output. *DSS* is written in Pascal, and the executable program files are often 180K or more, which explains the large number of disks. The system works with floppy or hard disk systems; even hard disk users may be tempted to use floppies rather than tie up two or three megabytes for all the *DSS* files at once. GSC provides a simple install program, which takes only a few minutes to run; inexplicably, it allows hard disk drive designations only up to drive E:. My system uses drives up to I:, and it would be easy for GSC to include more flexibility.

The program requires a color graphics card to produce its nice on-screen graphics. Unfortunately, the IBM's color-mode resolution is insufficient to display the charts in full detail, so *DSS* uses an every-other-line display if the user wants to see the entire chart at once. This program really needs the high resolution of a Hercules-type monochrome graphics board, but

● *Individual task responsibility can be shown on the PERT chart from the* Decision Support System.



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1·2·3

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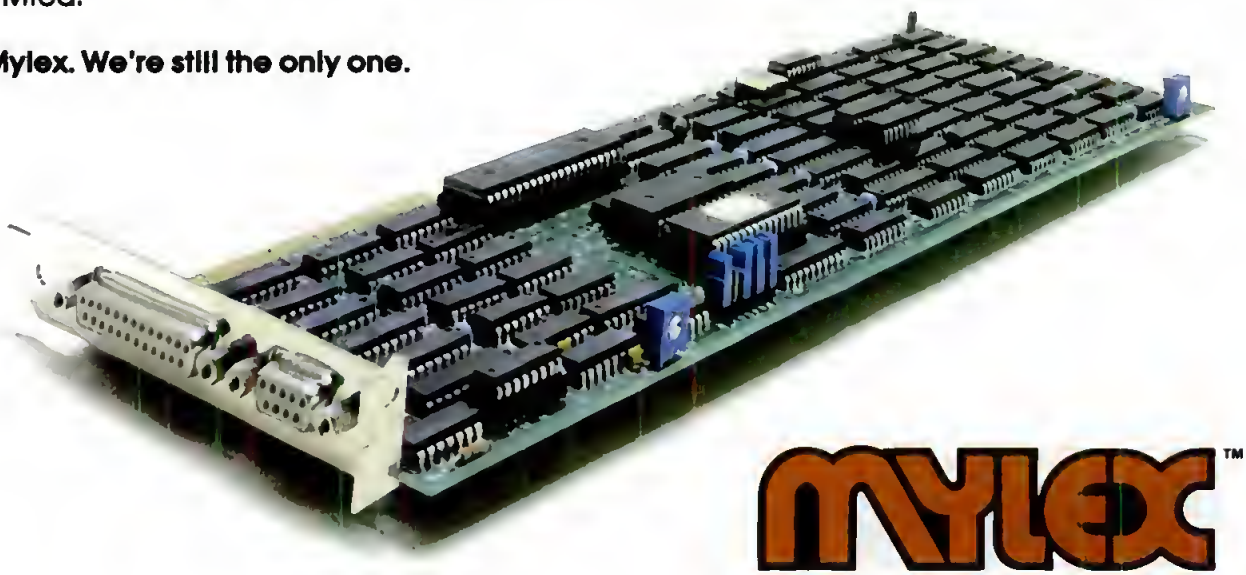

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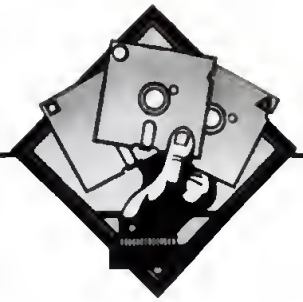
CIRCLE 372 ON READER SERVICE CARD



GSC doesn't support this option. *DSS* can display four quadrants of the full chart or a variable position window showing about ¼ of the total chart, and the cursor controls can be used to move the window view to any position on the chart. This useful compromise shows the portion of the chart selected in good detail. The program displays the entire chart in color, black-on-white, or white-on-black.

LOGICAL MENUS

DSS is menu-driven, and logical menus lead the user through initialization and into the data-entry and chart-production phase. The system has its own directory of stored chart data and includes utilities to reload, rename, delete, and manipulate stored files. All data must be entered directly into *DSS*, though GSC promises a future enhancement to allow downloading of data from external sources.

The system uses the Shift, Ctrl, and Alt keys as well as standard function keys very effectively. The key definitions are fairly consistent in all 11 chart modules, with a few of the keys modified for specific charts. The manual does not help you get comfortable with this program, but, after a few minutes of use, the elegance of the design becomes apparent. The documentation, by the way, is a photocopied word processor printout, and it has several errors and strange usages. I won't rate it poor, but it clearly needs revisions.

No disk tutorial is provided, but sample charts and instructions on entering new demo charts are helpful. There is also on-screen, context-sensitive help available. A portion of the screen is used to display selected function key commands (there isn't room for all of them), but this part of the display can be turned off by experienced users.

A GRAPHICS MODE

Some of the chart programs work only in a graphics-oriented mode, while others use both text and graphics. *DSS* prompts the user for input wherever possible, and, after a brief familiarization period, you will find data entry quick and easy.

The printed output produced by *DSS* is good, but plotter output would be far better. The charts are produced quickly.

General Software is primarily a consulting firm dealing with the government. *DSS* has evidently had reasonable success in this market, but it's too costly for even corporate microcomputer users. It works quite well and uses the IBM color capabilities nicely, but I think it needs further development to reach a wider audience among serious project managers.

—Glenn A. Hart

GANTT-PACK: TIME FACTOR FLEXIBILITY

FACT FILE

Gantt-Pack, Version 3.0
Gantt Systems Inc.
495 Main St.
Metuchen, NJ 08840
(201) 494-4752
List Price: $395
Requires: 128K RAM, two disk drives.

Gantt-Pack is a Gantt chart generation package designed by Gantt Systems for small business and manufacturing systems projects. The program offers flexibility with a variety of time factor options, particularly for multiple events with no clear critical path or terminations.

A COMPLEX MANUAL

The manual states that every effort was made to make the program easy to use, but, unfortunately, *Gantt-Pack* doesn't live up to that billing.

It took me 2 to 3 hours to familiarize myself with the program, an excessive investment of time considering the value received and the program's relatively simple user interface.

The *Gantt-Pack* documentation assumes you know how to use your computer and how to make a copy of the distri-

bution diskette. There is no other installation action required for the IBM PC version of the program. The manual includes good screen representations, and the directions for the use of each screen are clearly written. The *Gantt-Pack* manual includes no index, but I think one would be very useful.

NO ON-LINE HELP

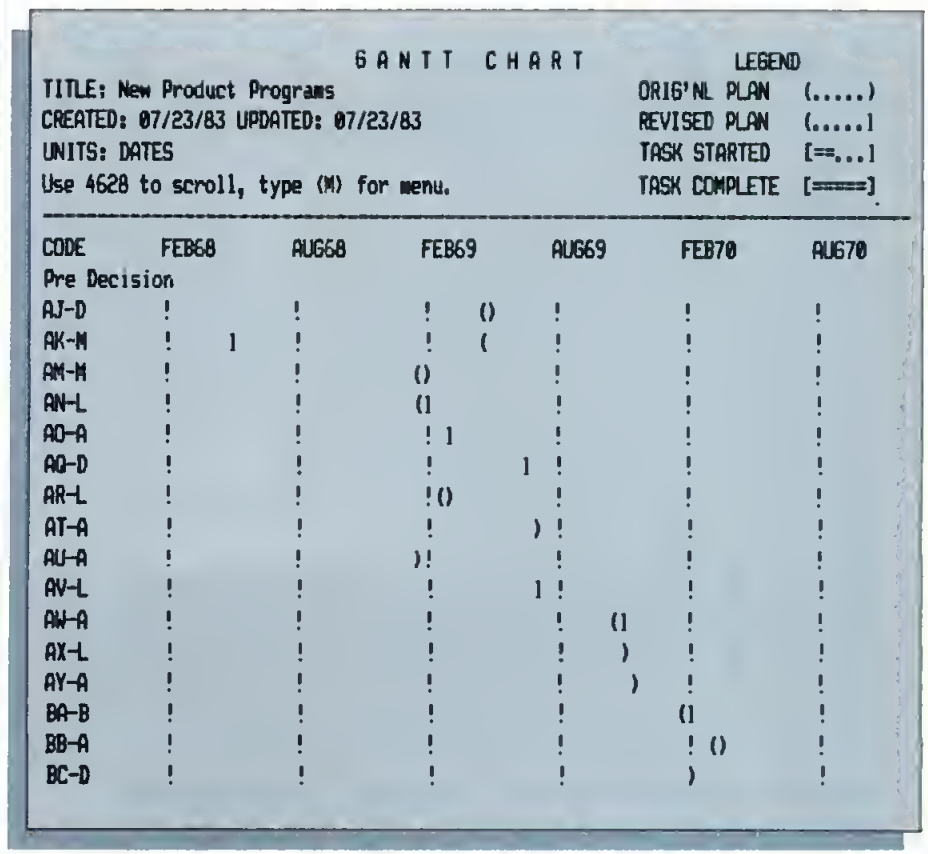
If you lose the *Gantt-Pack* manual and haven't used the program for a couple of weeks, you are out of luck because the program provides almost no on-line help, and the prompts and input methods are different enough from common practice to be confusing if you haven't used them repeatedly. For example, to make selections from the menu, you must simultaneously enter the first letter of the name of the menu section you want and the bracketed number next to the subsection you want. I found the combination to be confusing because the first letters of the menu sections are not highlighted or bracketed or visually set off in any way. In addition, this program does not show you the data files on the diskette. You have to know the name of the data file you want to use before you start the program. Although these are minor flaws that are quickly overcome, they are all the more annoying because they could have easily been avoided.

Since data entry is a critical task demanding the utmost in accuracy, you might expect the data entry screen to prompt for the information, provide a picture of what has already been entered, and check for errors. The *Gantt-Pack* data entry screen does an adequate job of prompting, but you have to mentally transport the field labels from the top of the screen where they are displayed to whatever line you are working on at the time. You need eagle eyes for this work. The screen is so tightly packed with data that you can easily lose your place if you glance away. Moreover, the program does not beep or flash an error signal if you enter something incorrectly. Although it will not accept the improper entry, it doesn't tell you it refused the entry. In other words, if you don't notice that the line above the cursor doesn't include the last entry you typed, you won't discover your error until you look at the final chart.

THE CASE STUDY

It took me almost 2 hours to enter the *PC* case study into *Gantt-Pack*. Part of this time was spent simply trying to understand the format used for defining the various data entry fields. *Gantt-Pack* allows you to enter not only the task but also a name of a phase, which is a large group of tasks. I designated tasks as being in either preproduction or post-production decision phases.

The time element entry format in *Gantt-Pack* is designed to be flexible, but



● *Gantt-Pack's Gantt chart shows original and revised plan data and started and completed tasks.*

it became a burden when I tried to apply it to the case study because the *PC* model wasn't designed with *Gantt-Pack*'s variety of time element options in mind. The program's time entry element allows you to choose dates, hours, or other measures of time when you initially set up the data entry format. The "other" category gives you flexibility to use measures such as worker hours, number of days, picoseconds, or any other standard factors. If you know these options are available to you when you diagram the steps in the project, you can choose a combination of factors to fit your program. The *PC* model uses starting dates and then projects the number of days each action will take. I was then faced with the choice of using the first event as "day zero" and then translating every following date into day 0+ or sticking with dates and then manually translating every task duration into a completion date. You could avoid this translation task if you knew you were going to use *Gantt-Pack*, but predesigning the project description to the program is not always possible.

It is relatively easy to edit the task data in *Gantt-Pack*. I added and deleted tasks, and the program responded quickly each time. *Gantt-Pack* cannot automatically take holidays into consideration, nor can it produce resource management reports.

SPECIAL FEATURES

Gantt-Pack software has been marketed in CP/M and TRS DOS versions since 1978. The PC version of the program is not customized to the IBM keyboard or video graphics but will run on almost all MS-DOS machines, including the Tandy 2000.

Gantt-Pack produces charts that do not include any graphic characters or designs, so they can be run off on any printer capable of generating 132 columns of print. The program has the ability to send a prestored string of characters to the printer, so it is possible to put the IBM PC printer or similar dot matrix printers into a compressed-print mode. This produces squeezed charts, and their practicality depends upon the time increments you have used. For instance, if your project has small time increments, such as a day or two, you would not find this print mode useful because your squeezed chart would probably consist of only a back-to-back set of brackets.

FOUR PRINTED PRODUCTS CAN BE PRODUCED BY GANTT-PACK: LISTINGS OF ORIGINAL DATA, REVISED DATA, A FAIRLY STANDARD GANTT CHART, AND A CRITICAL MILESTONE CHART HIGHLIGHTING TASKS RUNNING LATE.

The program is not copy protected, so it can be easily run in a hard disk system. However, since the entire program resides in RAM, the only advantage to using a hard disk system is the speed of data-file access.

Gantt-Pack has the ability to write files in a format that can be imported by Lotus's *1-2-3*. You must set some parameters in *1-2-3* for it to accept the *Gantt-Pack* format, but this should not present a problem, because these steps are clearly described in the *Gantt-Pack* manual.

PROGRAM CAPABILITIES

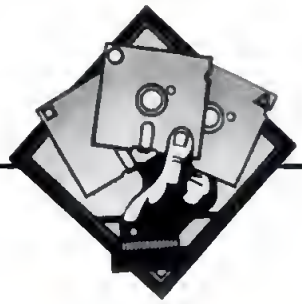
Gantt-Pack is an appropriate program to use if you have a number of parallel or random tasks as opposed to serial ones. According to a representative of Gantt Systems, the program has been successfully used by small-business managers and by educators for class scheduling. These are appropriate applications because they have many simultaneous or repetitive tasks but do not necessarily require a clear critical path. You can enter an unlimited number of open-ended tasks into *Gantt-Pack*.

Four printed products can be produced by *Gantt-Pack:* a listing of the original data, a listing of revised data, a fairly standard Gantt chart, and a critical milestone chart highlighting tasks that are running late. The critical milestone chart shows the status of the tasks as of the date or time the chart was produced. *Gantt-Pack* defines critical milestones as a special category or group of tasks with only an ending date.

A *Gantt-Pack* special feature is its ability to sort the tasks according to ten different criteria, including phase, task, code, start date, and end date. I didn't like the fact that the Gantt and milestone charts provide only numbers, not names of the events. The only way you can get the names of the events is to cross-reference the event codes on the charts with the printout of original or revised data, a somewhat bothersome extra step.

SUMMARY

As far as value is concerned I believe *Gantt-Pack* is a little overpriced and too difficult to use for the capabilities it provides. However, it may be appropriate for certain applications that incorporate many parallel tasks.—**Frank J. Derfler, Jr.**



MICROSOFT PROJECT: GREAT VALUE AT $250

Microsoft Project
Microsoft Corporation
10700 Northup Way
Box 97200
Bellevue, WA 98004
(206) 828-8080
List Price: $250
Requires: 128K RAM.

CIRCLE 746 ON READER SERVICE CARD

As every space-adventure fan knows, computer programs have personalities. Some are easier to take than others. Sometimes the most talented are not the easiest to live with. With programs, as with people, we can accept certain weaknesses if the strengths are on our "wanted" list. *Microsoft Project* is a likeable program that doesn't pretend to have it all.

GETTING STARTED

Microsoft Project is efficiently packaged in Microsoft style. The manual comes in a plastic "EaselBox" that doubles as a bookstand; it makes those first hours of thumbing through the manual just a little more comfortable. The reference manual is well illustrated, well organized, and includes an index.

Microsoft's programs are all copy protected in a similar way: You can make one copy of the program disk and one copy of the backup program disk. Screen prompts to perform the copy procedure are easy to follow. Installation takes only a few minutes, and the documentation is clear on the subject.

One of *Project*'s outstanding features is that it is extremely easy to use. The tutorial, which takes only half an hour to complete, gives you a good overview of the program, and it's well documented, with clear instructions and illustrations.

Project is completely menu-driven, which made entering the case-study data quick and easy; it took just over an hour. Unfortunately, the case study didn't make use of one of *Project*'s strongest features: resource allocation and costing.

Project produces a number of reports that are useful for project control. A visually unimpressive Gantt chart prints sideways by default, which is nice. The Project Detail report devotes a full page to all available information on each activity, including a cost summary of all resources assigned to that activity.

The Table report summarizes information for each activity, such as its duration, early and late start and finish, available slack time, and whether or not the activity is critical. The Resource report lists each resource and gives a summary of time committed and costs.

DESIGN

Project uses a design similar to Microsoft's *Multiplan*, *Word*, and *Chart*. Command choices appear at the bottom of the screen; you can enter a command by entering the first letter or by using the arrow keys to highlight it and pressing Return.

Three screens are available: the Calendar screen, where the work calendar is defined; the Resource screen, where a table of resources and their related costs appear and where new resources can be

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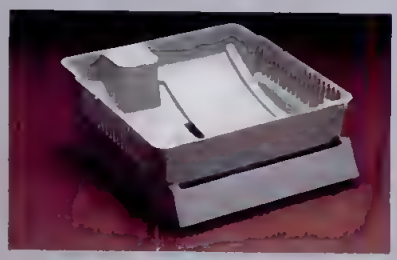

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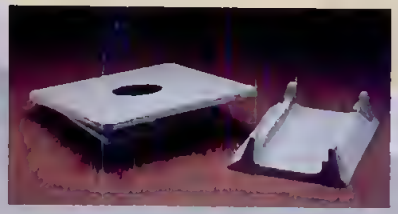

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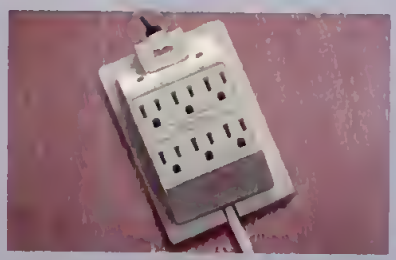

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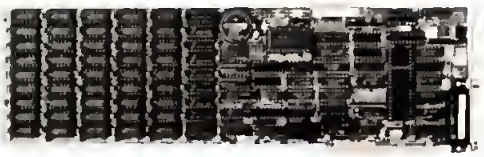

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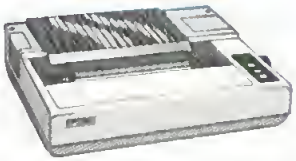

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CIRCLE 228 ON READER SERVICE CARD

entered; and the Activity screen, where individual activities are entered and displayed on a Gantt chart.

The program is extremely easy to use. The first step is to set up the work calendar on the Calendar screen. You select work days or declare holidays using the space bar and the arrow keys. It takes only 5 minutes to set up a calendar for 5 years of a typical 5-day work week with half-a-dozen holidays. Once you set up a calendar, you can use it with any project.

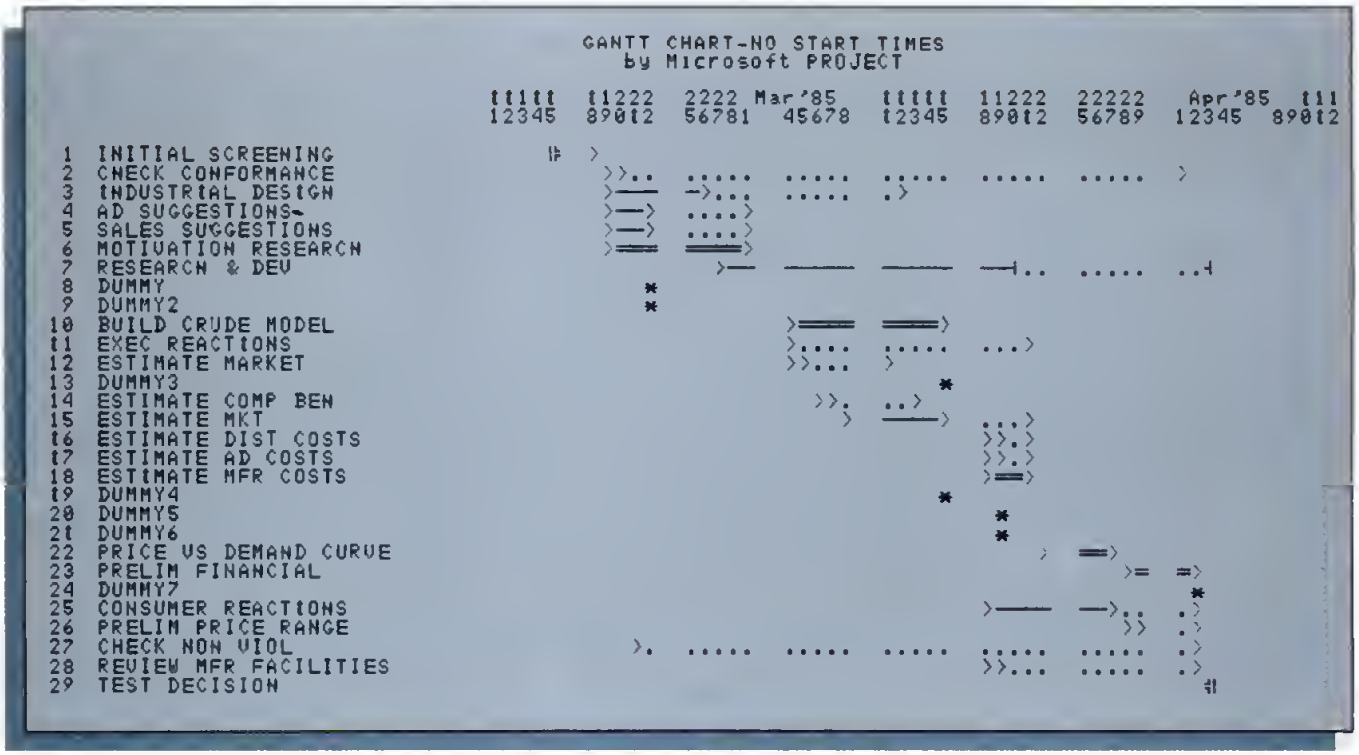
Next you enter each activity, designating the description, the duration, start date, predecessor activities, and resources. While entering resources you can designate each resource's unit cost and the amount of time per day it is available. For instance, a worker might be available only 50 percent of each day and spend only 20 percent of each day on task number 3. *Project* automatically calculates the total amount of time each resource is used and the total cost of each resource.

Project offers a sorting feature that allows you to rearrange activities by how critical they are (critical activities are listed at the top of the schedule), duration, start dates, finish dates, or alphabetically.

Using the XTERNAL command, you can "link" other projects into your current project as subtasks. When a link is defined, the entire external project becomes a single activity in the current project, and the program uses the start date and duration of the external project to calculate a new schedule. This is an extremely useful feature for dealing with large projects. You can construct a common sequence of events once—such as "pour the foundation"—and include it in many projects or at several points in one project. Changes in the "pour the foundation" project file will automatically be reflected in all projects that include that task.

Another of *Project*'s nice features is its histograms, which show the daily amount of time assigned to each resource. You can easily look ahead to find slack time for a resource, and efficiently schedule more work, routine repairs, a major overhaul, or a vacation (depending on the nature and needs of the resource). Histograms can be

● *Project's Gantt chart displays the critical path (==), milestones (*), and slack time (. . .).*



examined quickly and easily on the screen; they print out slowly, and require quite a few pages for each person.

Microsoft Project boasts the use of the Microsoft Mouse. We're mouse fans, but here we found the mouse less convenient than the cursor keys. On most screens the cursor could move only vertically or horizontally so the mouse didn't make it easier to jump from one area to another.

SUMMARY

Every feature included in *Microsoft Project* is well thought out and easy to use. Its weaknesses are simply the features that are not included in this version: it can't graph PERT charts. You can't enter the latest finish or "drop dead" date for a task. You can't enter fixed costs or income for each task.

Then again, no program can have it all. As we gain experience in shopping around for just the right package, we may find ourselves adopting the attitude of a seasoned loan officer looking at commercial loan applications: Flashy, new business ideas—no matter how promising—may be rejected in favor of simpler proposals from firms with a history of quality and service, diverse sources of income, and a team that's already proven itself. By these measures, *Microsoft Project* may be your choice over other packages from new, single-product manufacturers.

At the same time, we ought to check ourselves: Are we acquiring blind prejudices that favor certain manufacturers and ignore others? Are we kidding ourselves by thinking that companies with a longer history will serve us better than ambitious newcomers? Having asked ourselves these questions, we still believe that *Microsoft Project* is the best value for price.

—Diane Burns and S. Venit

MORGAN PATHFINDER: ONE JOB WELL DONE

Pathfinder, Version 1.1
Morgan Computing Company, Inc.
10400 North Central
Expressway #210
Dallas, TX 75074
(214) 739-5895
List Price: $80
Requires: 128K RAM, one disk drive.

CIRCLE 790 ON READER SERVICE CARD

In these days of multifunction and multibuck software, it is refreshing to find a program like *Pathfinder* from Morgan Computing Company that does one task well and gives a fast payback. *Pathfinder* may not be glamorous, but it is functional for someone who needs a good Gantt chart and task listing with simple computing and printing equipment.

Pathfinder's competency starts with its clear documentation, which sets you up right away to install and run the program, make changes, and print the reports. To install *Pathfinder* you simply copy two program files from the distribution diskette. Data files then can be stored on either the program diskette or any other system diskette. The program also has a built-in capability to display a directory of its data files on any system disk, a handy feature left out of many more costly programs.

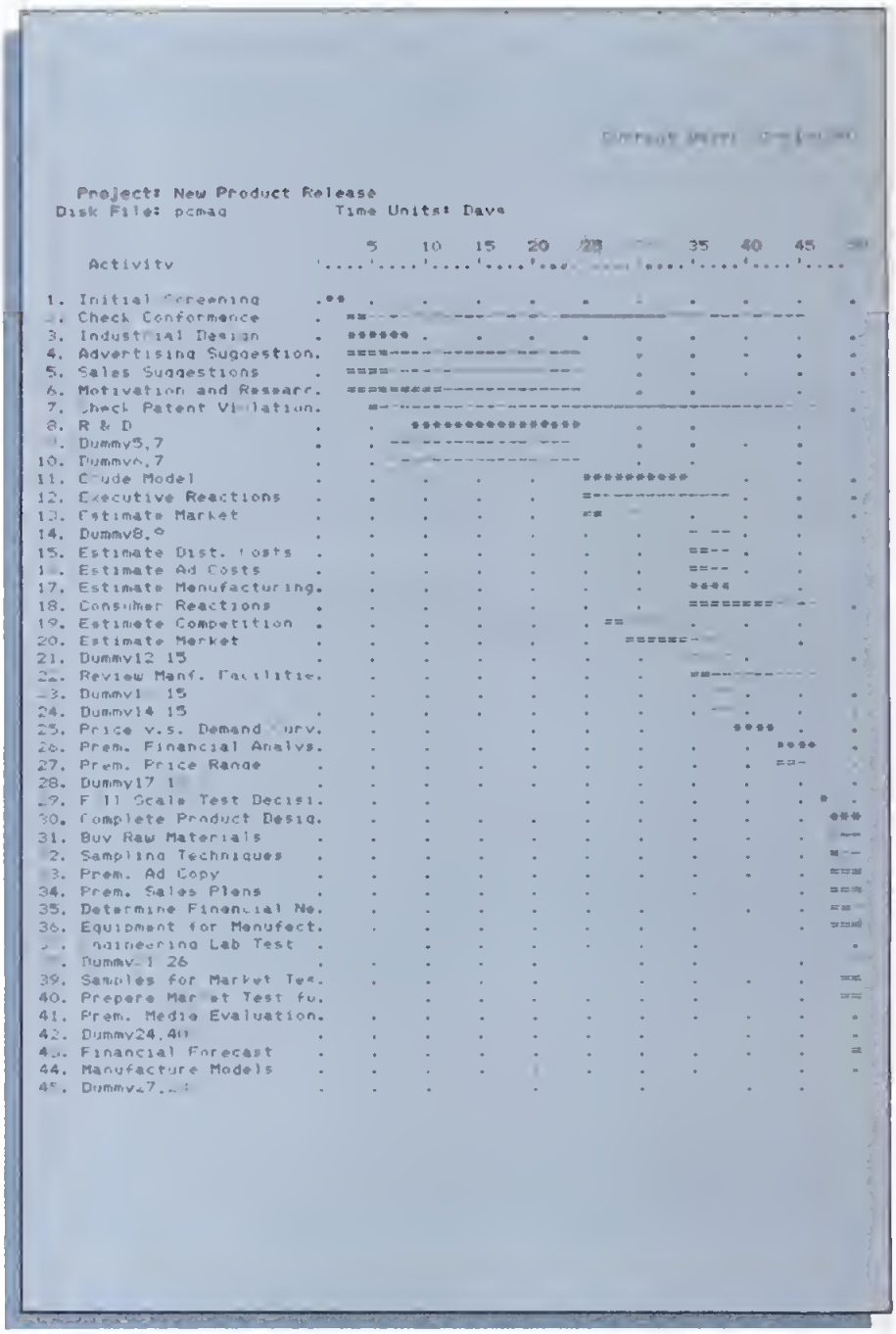
NO EXPLAINING NECESSARY

You'll notice that *Pathfinder* lacks both a tutorial and help screens, but that's no problem as the program doesn't need a lot of explaining. The program accepts only four elements for each task: name, beginning event number, ending event number, and time to perform the activity. It won't

accept dates or even fractional portions of a work time. Nor will it accept holidays or reshuffle the data, but it creates Gantt charts quickly and prints just as fast.

If you buy *Pathfinder*, make sure you get Version 1.2 or a later one as the earlier ones have problems. For example, the first version I reviewed (Version 1.1) had a few irritating traits that showed up during editing. Using this one, I had to press the Enter key to execute some functions and input a single character or a letter to execute others. If you hit the Enter key along with one of the single-key entries, the computer interprets the Enter as the answer to the next question. This could be inconvenient if it happened at the wrong point in the data-entry process. An updated version of the program corrects this situation and several others. If you do have a version of *Pathfinder* older than 1.2, these problems can be corrected with an upgrade that costs $20.

Because of *Pathfinder*'s relative simplicity, entering the *PC Magazine* case study took only 20 minutes. But then I noticed a problem: the program won't accept an unterminated action. It won't run if there is more than one action that doesn't have a continuing connection. This forced me to extend some of the dead-end actions in the case study to some convenient and logical function by creating dummy activities. Extending the actions led me to make eight links. For example, I connected the action called "Determining the Ad Budget" to the one called "Selecting the Media." I also connected "Hiring a Sales Manager" to "Establishing Distribution Channels." When



● *Pathfinder's Gantt chart shows tasks with critical path and slack highlighted over user-defined time units.*

you make the PERT chart, the only allowable unterminated action is the final one.

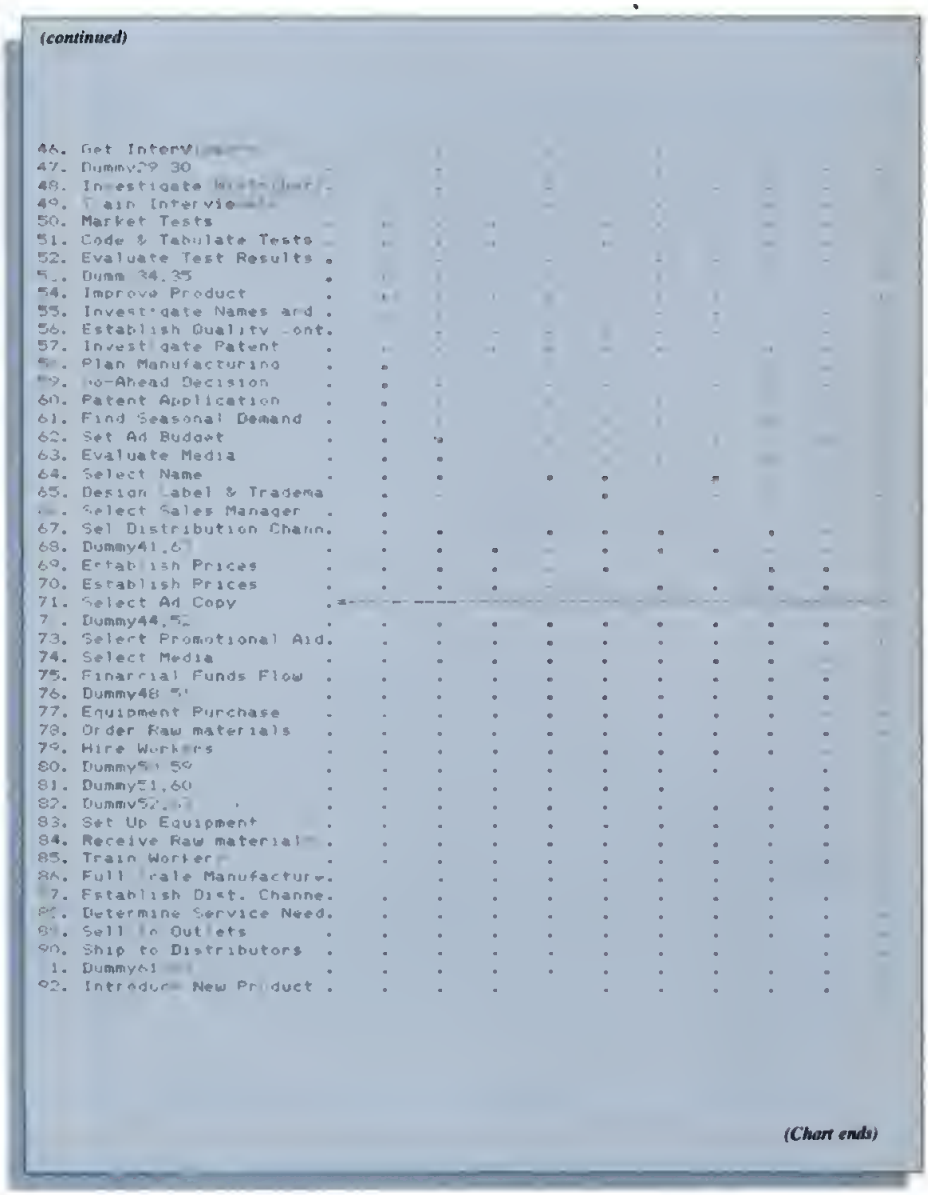
Pathfinder's editing function works smoothly and quickly. Various subelements of any task can be changed or deleted and the entire problem is automatically reordered and rearranged. The data entered into the system are checked for logic, and the error messages are presented in understandable English.

The program uses a simple printer interface, and the Gantt chart it produces could be run on any type of printer, including letter quality machines without graphics. *Pathfinder* produces only event listings and Gantt charts, but the outputs can be directed to either the printer or the screen, and the printer commands are clearly prompted. The *Pathfinder* program comes in versions that print out 80-column or 132-column Gantt charts. You can print files created under one program through the other one. The printed output is not compressed, but the chart itself is broken at the right border. Event names are repeated in the left margin when the next set of timed events is printed. In other words, in the 80-column mode the first printing names all of the events and activities for days 0 through 50. The second chart names all of the events and the activities for days 50 through 100. This printing method eliminates the need to cut and paste charts.

Pathfinder is not tailored to the IBM PC keyboard. It probably would run well in any MS-DOS hardware that can read the PC-DOS format. You can run it from a hard disk because it is not copy protected, but you wouldn't gain anything in performance since all the executing program and the data are contained in RAM.

Pathfinder is an honest and fast $80 program that creates and prints Gantt charts well. If this is all you need, you shouldn't pay for more elaborate programs. *Pathfinder*'s capabilities are light-years ahead of the pencils and T-squares many of us still use for producing charts. I know that around my office, *Pathfinder* could pay for itself very quickly.

—Frank J. Derfler, Jr.



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Megastore is upgradeable and comes in four models: 20 MB with 25 MB tape, 10 or 20 MB disk, or 25 MB tape.

CIRCLE 110 ON READER SERVICE CARD

PERTMASTER: A WORKHORSE OF A PROGRAM

PertMaster, Version 4.6
Westminster Software Inc.
3000 Sand Hill Rd.
Bldg. 4, #242
Menlo Park, CA 94025
(415) 845-1400
List Price: $695/1500 tasks, $895/2500 tasks.
Requires: 128K RAM, two double-sided disk drives, DOS.

CIRCLE 780 ON READER SERVICE CARD

PertMaster, from Westminster Software Incorporated, is a thoughtfully crafted product fully suited for medium to large planning efforts. Indeed, for its $650 price tag, this highly flexible product has a lot going for it.

PertMaster runs under CP/M with a minimum of 56K RAM or PC/MS-DOS with at least 128K RAM. It requires one disk drive, but Westminster Software suggests two disk drives and recommends a hard disk for large projects. *PertMaster* provides direct support for the IBM PC-XT, Compaq, GRID Compass, Sirius/Victor, and Eagle PC 16-bit models.

Moreover, *PertMaster* allows up to 1,500 activities per project and 29 resources per activity for a 16-bit machine with 256K RAM. An optional version for $895 supports 2,500 activities.

5-MINUTE INSTALLATION

PertMaster installation takes less than 5 minutes. The system's programs and files come on two disks. To get them up and running, I had only to copy the contents of these publisher-supplied disks to my 20-meg hard drive.

Westminster Software uses the common protection scheme, which requires that a factory-supplied disk be available in the A: drive whenever the program is initiated. I believe this system reduces the value of the product because it forces you to swap diskettes—a waste of time for hard-drive users.

Westminster provides a small but well-executed documentation manual for *PertMaster*. The 140-page manual is bound in an IBM format, three-ring binder. It offers a solid tutorial and a good reference section. The only poor grade I give this documentation is for its skimpy error-handling section. However, Westminster promises a major revision of *PertMaster*'s manual by mid-fall.

SPECIAL FEATURES

By the time I tackled *PertMaster*, I had already reviewed three other planning programs that were similar to it in scope and complexity. Therefore, I was beginning to establish enough experience with project-planning-type packages to appreciate some of *PertMaster*'s really nice features.

For example, *PertMaster* allows you to create an unlimited number of calendars with various workday, holiday, and shift-work situations. Any of these calendars can be used with any job. And I was particularly impressed with the calendar editing feature, which enables you to use wild cards to enter repetitive holidays in a 10-year calendar with a single set of keystrokes. For example, you can enter "25 December XX," and the program will automatically assign a Christmas holiday for each year of your project.

PertMaster does not limit holidays or the number of odd and complex working schedules, such as half-days and shifts, that you can create. *(continued)*

● *PertMaster lists tasks on the Gantt chart by their start and end nodes.*

```
PC Magazine Test
      REPORT TYPE :PERIOD BARCHART                                    PRINTING SEQUENCE  :Earliest Activities First
                                                                      SELECTION CRITERIA :ALL
      PLAN I.D.   :PCTEST   VERSION  13                               TIME NOW DATE      : 2/JAN/84
=========================================1984=========================================================================
   PERIOD COMMENCING DATE              '2    '9    '16   '23   '30   '6    '13   '20'23'27   '5    '12   '19   '26   '2    '
   MONTH                               'JAN  '     '     '     '     'FEB  '     '  '  '     'MAR  '     '     '     'APR  '
   PERIOD COMMENCING TIME UNIT         '1    '6    '11   '16   '21   '26   '31   '36'38'40   '45   '50   '55   '60   '65   '
=========================================================================================================================
  1-   2 Initial screening              '     '     '    C'     '     '     '     '  '  '     '     '     '     '     '     '
  2-   4 Industrial Design              '     '     '    C'     '     '     '     '  '  '     '     '     '     '     '     '
  2-   7 Motovational research          '     '     '    ='=.   '     '     '     '  '  '     '     '     '     '     '     '
  2-   5 Advertising Suggestions        '     '     '    ='..   '     '     '     '  '  '     '     '     '     '     '     '
-------------------------------------------------------------------------------------------------------------------------
  2-   6 Sales Suggestions              '     '     '    ='..   '     '     '     '  '  '     '     '     '     '     '     '
  2-   3 Check Prodt Conformance        '     '     '    ='.....'     '     '     '  '  '     '     '     '     '     '     '
  3-  18 Check Prodt Patent Situation   '     '     '    ='.....'     '     '     '  '  '     '     '     '     '     '     '
  4-   7 R&D on Model                   '     '     '     'CC   '     '     '     '  '  '     '     '     '     '     '     '
-------------------------------------------------------------------------------------------------------------------------
  7-   8 Build Crude Model              '     '     '     '  CC '     '     '     '  '  '     '     '     '     '     '     '
  7-  10 Estimate Markets               '     '     '     '  C  '     '     '     '  '  '     '     '     '     '     '     '
  7-   9 Executive Reactions            '     '     '     '  =. '     '     '     '  '  '     '     '     '     '     '     '
 10-  11 Estimate Competive Behavior    '           '     '  C  '     '     '     '  '  '     '     '     '     '     '     '
-------------------------------------------------------------------------------------------------------------------------
 11-  12 Estimate Market Potential      '     '     '     '  CC '     '     '     '  '  '     '     '     '     '     '     '
  8-  15 Estimate Manufacturing Costs   '     '     '     '   C '     '     '     '  '  '     '     '     '     '     '     '
  8-  14 Estimate Advertising Costs     '     '     '     '   C '     '     '     '  '  '     '     '     '     '     '     '
  8-  13 Estimate Distribution costs    '     '     '     '   C '     '     '     '  '  '     '     '     '     '     '     '
-------------------------------------------------------------------------------------------------------------------------
  9-  18 Consumer reactions             '     '     '     '   CC'     '     '     '  '  '     '     '     '     '     '     '
 12-  18 Review Manufacturing Facilitie '     '     '     '   =.'     '     '     '  '  '     '     '     '     '     '     '
 15-  16 Price vs. Demand Curve         '     '     '     '   CC'     '     '     '  '  '     '     '     '     '     '     '
 16-  17 Prelim financial analysis      '           '     '    C'     '     '     '  '  '     '     '     '     '     '     '
-------------------------------------------------------------------------------------------------------------------------
 16-  18 Preliminary Price Range        '     '     '     '    C'     '     '     '  '  '     '     '     '     '     '     '
 13-  19 Full scale Test Decision       '     '     '     '    C'     '     '     '  '  '     '     '     '     '     '     '
 19-  20 Complete Product Design        '           '     '    C'C    '     '     '  '  '     '     '     '     '     '     '
 19-  26 Equipment for Manufacturing Ne '     '     '     '    C'CC   '     '     '  '  '     '     '     '     '     '     '
-------------------------------------------------------------------------------------------------------------------------
 19-  22 Sampling Techniques            '     '     '     '    ='..   '     '     '  '  '     '     '     '     '     '     '
 19-  21 Buy Raw Materials              '     '     '     '    ='..   '     '     '  '  '     '     '     '     '     '     '
 19-  23 Preliminary Advertising Copy   '     '     '     '    ='=..  '     '     '  '  '     '     '     '     '     '     '
 19-  25 Determine Financial Needs      '     '     '     '    ='=....'...  '     '     '     '     '     '     '     '     '
-------------------------------------------------------------------------------------------------------------------------
Barchart Key:-  CCC :Critical Activities  === :Non Critical Activities   NNN :Activity with neg float   ... :Float
```

You can set up a project using either the arrow or precedence method. With the arrow method, or Gantt chart, a task exists on a line between nodes. In the precedence method, or PERT chart, jobs exist on the nodes and are connected by arrows. Using the arrow method, I was able to enter the PC case study in 30 minutes—about half the time required in other programs.

WITH THE ARROW METHOD, OR GANTT CHART, A TASK EXISTS ON A LINE BETWEEN NODES. IN THE PRECEDENCE METHOD, OR PERT CHART, THE JOBS EXIST ON NODES AND CONNECT BY ARROWS.

PertMaster supports two type-ahead modes: normal and executive. These can be used by a fast typist or—better yet—by a slow typist with *ProKey*, by RoseSoft Inc., to make task input even quicker.

PertMaster makes use of function keys and always provides a function key menu at the bottom of the active page.

Another nice feature is *PertMaster*'s abbreviation library. You can establish your own abbreviations for tasks and resources, and once you enter them in the library, they will be recognized by *PertMaster* anywhere in the program.

STANDARD REPORTS

PertMaster's standard reports include the following: project bar chart, period bar chart, activities sorted by early start, float, description or activity number, user-defined selective reports on activity type or resource used, resource requirements in tabular form, resource requirements in histogram form, cash-flow requirements for multiple cash categories, logic reports, working-day calendar report, user abbreviations report, and an on-screen reporting facility.

The program offers highly flexible time periods, allowing tasks to be timed in seconds, minutes, hours, days, shifts, weeks, months, years, or as a unit of completed work periods when several projects are merged.

To add a task, you insert the project, its description, and relationships to existing tasks. And to delete an existing task, you erase the task and manually reconstruct the relationships among the remaining tasks.

NEGATIVE ASPECTS

On the down side, this otherwise excellent package seems to have a serious problem with error trapping—at least in Version 4.6, which I reviewed. The program bombed out several times by announcing that an "out of string space" error had occurred.

The technical folks at Westminster admitted that they had seen the error before, that it had nothing to do with string space, and that it could sometimes be fixed by recopying both of the program disks to the active disks. When this failed, I ultimately tracked the error to the program's inability to deal with a task that erroneously connected an existing node to a nonexistent node, which appeared after the formal finish of the task.

Westminster told me that the system should detect such errors in logic and simply warn you that the error had occurred. In my case, the system took a walk, and there was no clear explanation for the response.

Westminster immediately supplied me with a second system, which worked flawlessly. *PertMaster* currently supports most standard printers and gives you the opportunity to choose colors for various operating modes.

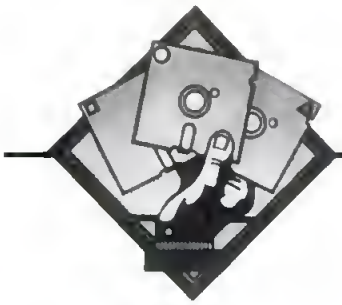
A NEW MID-FALL RELEASE

A *PertMaster* version to be released this fall is said to support plotters and contain an integrated database to facilitate manipulation of task-related financial information.

The current version allows planning data to be dumped in ASCII format for transfer to spreadsheets or word processors.

Overall, I like *PertMaster*. Error trapping withstanding, the system is professionally implemented with the user in mind. Compared with the other packages I have reviewed, *PertMaster* ranks high on the feature-versus-price scale. *PertMaster* should be a good buy—especially the upcoming version, which promises plotter support, better documentation, and improved error handling. **—Dick Aarons**

COMPARED WITH OTHER PACKAGES, PERTMASTER RANKS HIGH ON THE FEATURE-VERSUS-PRICE SCALE. PERTMASTER SHOULD BE A GOOD BUY—ESPECIALLY THE UPCOMING VERSION.



PRO-JECT 6: LITTLE DETAILS COUNT

PAH FILE

PRO-JECT 6
SoftCorp, Inc.
2340 State Rd. 580, #244
Clearwater, FL 33575
(813) 799-3984
List Price: $199, 250-task version; $149, 150-task version; $99, 75-task version.
Requires: 128K RAM, two disk drives, DOS 1.1 or 2.x.

CIRCLE 788 ON READER SERVICE CARD

PRO-JECT 6 is a bargain-priced product that offers many impressive features such as speed, report flexibility, and a large variety of print options. However, a number of irritating details make it unpleasant to use. If you can tolerate its shortcomings, it may be worth consideration.

Installation is a snap. The documentation clearly explains the process, and a screen print shows you the default values. It took me just a minute to make a few changes and scan the remaining defaults to see they were correct, and that was it.

PRO-JECT 6's tutorial walks you through all the different features and quickly teaches you how to set up projects and produce reports. A sample file shows you exactly what a project looks like. And since the tutorial is keyed to this sample, you can work with a complete project without having to key in all the tasks. The exercises were clear and helpful; I finished in half an hour.

DOCUMENTATION

The manual was apparently produced with a daisywheel printer and then its pages were reduced for offset printing. The only graphic elements are daisywheel screen prints, so the manual's pages are plain and covered with small type.

The writing is clear and concise. It omits a few important points, such as the restriction of dates to between 1980 and 1989, but it has a brief command reference section, a list of error messages, and appendixes with sample reports and tips on using the package with other programs. An index would be helpful; "Appendix E," on "Optional Shared Disk Support," was missing from my review copy.

THE CASE STUDY

Once I began running the case study, the problems began to accumulate. Data entry is easy and quick, but you must issue the ADD command for each task. You cannot simply enter an Add mode and then add one task after another.

PRO-JECT 6's nonstandard use of the Tab key—to advance from field to field while entering data—irritated me. Moreover, the Enter key is used to signal the end of a task entry, so if you hit it by accident—and you will hit it—you must go back and edit the task using the CHANGE command.

The original data for this project called for it to begin in 1968. After I put the first task in, an error message announced that the program only recognized dates from 1980 through 1989. The manual does not mention this important fact. I then translated the dates to 1988, but after entering 15 tasks, I realized that I would soon hit 1990, and, once again, my schedule would not be accepted.

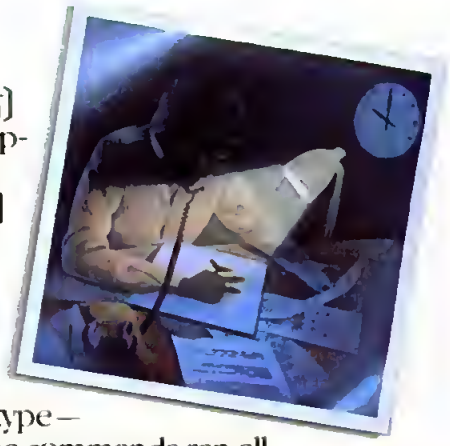
I started over (after having wasted half an hour of data entry) using a newer set of test data ranging from 1985 to 1987. After the twenty-ninth task, a new error message

"MY OWN RAGS TO RICHES STORY" CHAPTER 1

(Your picture here)

How *jr* Computerized the Books and I Saved $2,000

by _____
(Your name here)



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So I did. The price was right. So was the price of the PC*jr* computer* it ran on. The whole system cost $2,000 less than others I'd seen.

And it was so easy to use! No codes or names to type—just pre-assigned customer and vendor keys. Five basic commands ran all the modules I needed: _____ (Ledger, Sales, Payables, Receivables, *all of them*).

They work together, and all fit on one disk. The dealer said I'd save another bundle because I didn't need _____ (two disk drives, a consultant to set it up, a training course, *all the above*).

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Now, it's business as usual, only better. I actually have extra time to _____ (work on increasing profits, drum up more sales, relax).

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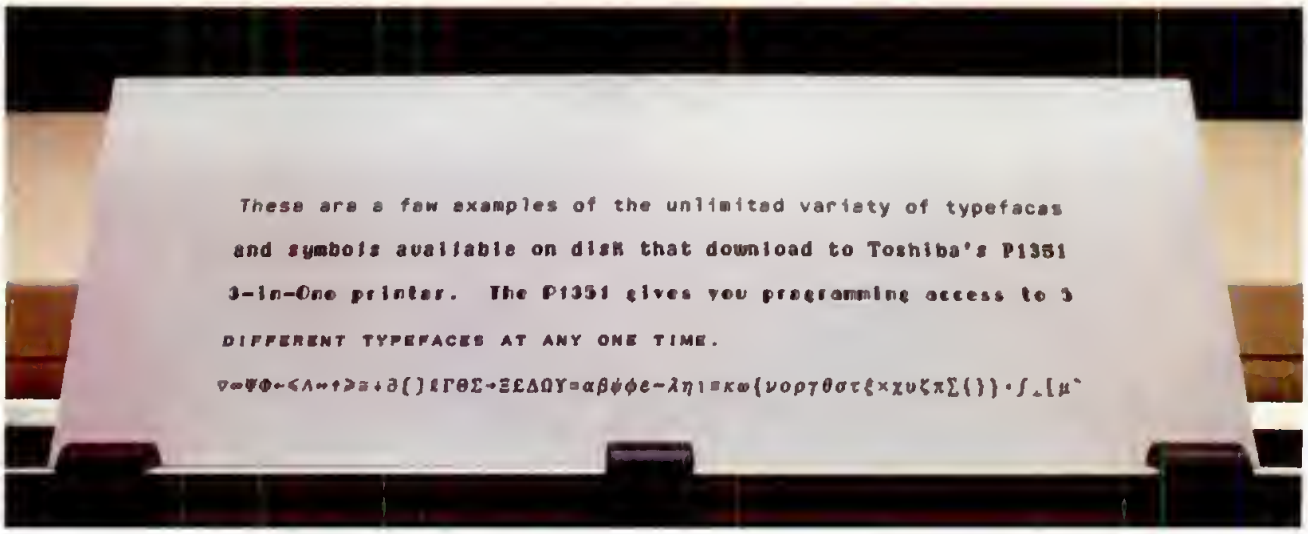

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CIRCLE 462 ON READER SERVICE CARD

appeared: "Project length is now greater than 300 periods—make it shorter." I later found this limitation mentioned in some of the sales literature but did not find it in the manual. I attempted to mend matters by removing the start dates from the tasks, but the program would not allow it.

By this time, I had wasted nearly 1½ hours, and I still had not learned to use the Tab key instead of the Enter key. I started over one more time, leaving out the start dates. This time I successfully entered the entire project. The only hitch came at the end of the sample data, which includes two ½-day-long tasks. *PRO-JECT 6* accepts only integer durations, from 0 to 99. I substituted a 1 for .5 in each case. Not counting the false starts, it took just under an hour to enter all the tasks.

The data entry was a little more difficult because the sample data was presented in terms of start and end nodes for each task. *PRO-JECT 6* prefers to describe task relationships in terms of "dependencies," so you must list the tasks that must be completed before the current task may start. *PRO-JECT 6* also assigns a number to each task, so I had to use these instead

● PRO-JECT/6's *Gantt chart can show task dependencies and completed tasks in addition to the critical path, float, and milestones.*

```
                                        PC Magazine, Project Management Systems                                  Frame: 1
08-14-1984  00:37:24                         PC Magazine Gantt Chart Sample                                     Page: 1

     Name Of Project:   PC Magazine: Project Management Systems
      Project Leader:   Ken Edwards


                                                FEB85                          MAR
Task Ref                                        15 18 19 20 21 22 25 26 27 28 01 04 05 06 07 08 11 12 13 14 15 18 19 20 21 22 25
No.  Code Description                            1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

  1  A    Initial Screening                    1 S=====> . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  2  D    Check Product Conformance            2 . . <=====> . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  3  M    Industrial Design                    3 . . . . <=================> . . . . . . . . . . . . . . . . . . . . . . . . .
  4  N    Advertising Suggestions              4 . . . . <----------->.......................................................>
  5  Q    Sales Suggestions                    5 . . . . <----------->.......................................................>
  6  L    Motivational Research                6 . . . . <---------------------------->.......................................>
  7  B    Res & Develop on Model               7 . . . . . . . . . . . <=============================================>
  8  M    Build Crude Model                    8 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . <=
  9  A    Executive Reactions                  9 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . <-
 10  A    Estimate Market Characteristic       10. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . <=
 11  A    Estimate Competitive Behavior        11. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 12  A    Estimate Market Potential            12. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 13  A    Estimate Distribution Costs          13. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 14  N    Estimate Advertising Costs           14. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Symbol Legend:

===  CRITICAL TASK       <  Task Has Dependencies
---  Non-Critical Task   >  Task Has Successors
...  Float Time          S  Task Has No Dependencies
:::  Completed Task      X  Task Has No Successors
*    Project Milestone   +  Current Run Date
```

of the task labels provided in the sample data. As a result, I had to translate the data before I could enter it.

When I printed the reports, the critical tasks were all correctly identified; however, a number of noncritical tasks were incorrectly marked as critical. I double-checked the Gantt chart but could find no reason for these spurious results. The reports were complete and flexible, but, even using the compressed font on an Epson printer, it took nearly 12 minutes to print the six pages of the Gantt chart.

I deleted a task (number 15) as required by the sample task, and *PRO-JECT 6* instantly adjusted the critical path calculations. When I went to reinsert the task using the same task number, I was given an error message for my troubles. I then added the task at the end of the list, moved it to its proper place, and checked the results. The critical path had not reverted to the previous result. To my dismay, I found out that *PRO-JECT 6* deletes all references to the deleted task in other tasks as well. I had to go back and edit the task that had listed number 15 as a dependency before the critical path was restored.

SPECIAL FEATURES

PRO-JECT 6 has a tremendous printing facility. In essence, it has one large menu of print options, from which you assemble the information you want included in a given report. For example, you can print the task description, status, duration, late finish date, and total cost, all sorted by status and subsorted by finish date. You can force new pages every time a data element changes. If, for example, you sort on Reference (which could be used to mark responsibility) and late start date and you force new pages for each new reference, you can produce separate reports for each person in the project.

You may set up files of preformatted report definitions. You may also route the results to the screen, printer, or disk file There are even facilities to prepare the results for use with *SIDEWAYS, 1-2-3,* and *WordStar*. Furthermore, you can define your own output profiles to make use of different printer features.

In addition to the data entry problems I have described, *PRO-JECT 6* has other rough edges, such as inconsistent formats for entering dates (sometimes MMDD-YY, other times MM/DD/YY). For example, the Enter key or Tab key is often required to advance to the next field, and sometimes the cursor will move ahead on its own after you enter the data.

Moreover, each time you enter the project maintenance or report sections, you must wait 30 seconds to 1 minute while it "creates a project calendar"—even if the project file is empty. You are asked to specify an output device when creating a report profile, but this instruction is then ignored when you ask to print the report, and you must make the choice again. **—Alfred Poor**

PROJECT MANAGEMENT: MODEST CLAIMS

PC TRACTION

Project Management
IIE Microsoftware
Institute of Industrial Engineers
25 Technology Park
Norcross, GA 30092
(404) 449-0460
List Price: $140, IIE members; $170, nonmembers.
Requires: 64K RAM, one disk drive.

CIRCLE 737 ON READER SERVICE CARD

Project Management offers four separate programs for simple, preliminary analysis of projects. It is an inexpensive package, written in unprotected, interpreted BASIC and designed for simple applications. The package doesn't produce fancy charts and graphs, but it does perform useful network analysis. *PM* makes only modest claims and fulfills them all.

PM was written for members of the Institute of Industrial Engineers, so its manual assumes some familiarity with both project management and microcomputers. For example, it never reminds you to make a backup copy of the program disk. Fortunately, *PM* is a snap to use.

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System requirements: Minimum 128K of memory. IBM Personal Computer, IBM PCjr, and true compatibles equipped with PC DOS or MS DOS operating systems. Pocket APL uses a soft character set for computers with graphics board or color monitor, keywords for computers with monochrome.

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CIRCLE 226 ON READER SERVICE CARD

CRITICAL PATH ANALYSIS

FROM NODE	TO NODE	EARLIEST START	EARLIEST FINISH	LATEST START	LATEST FINISH	TOTAL FLOAT	FREE FLOAT	CRITICAL PATH
1	2	0	2	0	2	0	0	***
2	3	2	4	43	45	41	0	
2	4	2	8	2	8	0	0	***
2	5	2	6	20	24	18	0	
2	6	2	6	20	24	18	0	
2	7	2	11	15	24	13	13	
3	18	4	5	45	46	41	41	
4	7	8	24	8	24	0	0	***
5	7	6	6	24	24	18	18	
6	7	6	6	24	24	18	18	
7	9	24	25	37	38	13	9	
7	10	24	26	28	30	4	0	
7	8	24	34	24	34	0	0	***
8	13	34	36	36	38	2	0	
8	14	34	36	36	38	2	0	
8	15	34	38	34	38	0	0	***
8	9	34	34	38	38	4	0	
9	18	34	42	38	46	4	4	
10	11	26	28	30	32	4	0	
11	12	28	34	32	38	4	0	
12	15	34	34	38	38	4	4	
12	18	34	36	44	46	10	10	
13	15	36	36	38	38	2	2	
14	15	36	36	38	38	2	2	
15	16	38	42	38	42	0	0	***
16	18	42	44	44	46	2	2	
16	17	42	46	42	46	0	0	***
17	18	46	46	46	46	0	0	***
18	19	46	47	46	47	0	0	***
19	20	47	56	47	56	0	0	***
19	21	47	48	63	64	16	0	
19	22	47	48	63	64	16	0	
19	23	47	53	64	70	17	0	
19	24	47	51	133.5				
					137.5	86.5	2	
19	25	47	49	106	108	59	0	
19	26	47	63	48	64	1	1	
20	26	56	64	56	64	0	0	***
21	26	48	48	64	64	16	16	
22	27	48	52	64	68	16	0	
22	28	48	52	64	68	16	0	
23	31	53	57	70	74	17	17	
25	38	49	51	108	110	59	59	
26	29	64	72	64	72	0	0	***
27	28	52	52	68	68	16	0	
28	30	52	56	68	72	16	16	
29	40	72	74	126.5				

You are up and running in no more time than it takes for you to copy *PM*'s four program files and get into BASIC.

Each program does a different kind of analysis, and each is described in a separate chapter. The manual outlines the concepts behind the analysis techniques and explains how to use the programs. Although the concepts are sometimes poorly explained, the instructions on how to use the programs are always clear.

THE CASE STUDY

The case study can be analyzed by running CPM.BAS (CPM means critical path method), the first of *PM*'s programs. The data input takes about 30 minutes. The program then requires about 110 seconds to determine the critical path and the amount of float for each activity. The resulting network analysis is displayed on the screen and can be printed out. *PM* doesn't produce highly sophisticated reports, so if you need a Gantt chart or a PERT chart, you have to draw it. On the other hand, the printout flags critical path activities. It also indicates the earliest possible start and finish days for each activity as well as total float and free float.

CPM.BAS doesn't offer you the option of cutting out activities and putting them back in, but you can change the data on any activity. For example, you can fool the program into dropping activity R in the case study by giving it crazy new values. For instance, you could say that R takes place between nodes with negative numbers and takes no time.

When you ask CPM.BAS to recalculate the critical path, it lists this "dummy" activity, but since it has no effect on the rest of the project, the analysis is still correct. The new critical path now runs through activities P and Q, and the total project completion time is cut by 2 days. The R task can be put back by giving the dummy its original values, and you get the old network analysis back.

Thus, you can delete and reinsert activities, but the fact that you have to use trickery to do it highlights one of CPM.BAS's great weaknesses: before you enter the data for a project, you have to tell the program exactly how many activities will go into it, and you can't add or delete from this number while using the program. After the analysis is finished, you can only modify activities. Moreover, you can't save the data you laboriously key into CPM.BAS. Once you exit the program, it is gone; you can't store data on disk and play with it later. In the real world, where project activities come and go and where one day's analysis must be changed the next, these are serious limitations.

PM's other three BASIC programs perform different analyses, but since the programs do not communicate among themselves, you have to key in the project data all over again. PERT.BAS (PERT stands for Project Evaluation and Review Technique) converts your best guesses of how much time each activity will take into an estimate of how long the entire project will take. You enter three different time estimates for each activity: an optimistic, a most-likely, and a pessimistic estimate.

The program then calculates the mean and the variance of the three time guesses as well as the mean and variance of the earliest and latest possible project completion dates. The program assumes a normal distribution of completion dates and calculates the likelihood of meeting a particular time schedule.

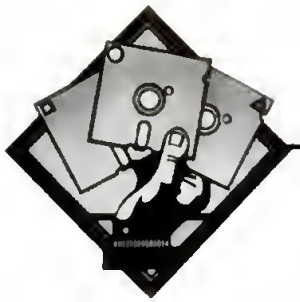
RESOURCE.BAS is supposed to tell you the best sequence for your activities if you have a limited resource. However, the program assumes that all activities require the same resource and that when one activity is finished, all its resources automatically move to the next activity—a silly assumption. For example, if the limited resource is manpower, it assumes all your workmen can do any job in the entire project. In other words, once the bricklayers finish laying bricks, they should start putting down the floor. The program also assumes there is only one limited resource, whereas there may be any number.

Within these constraints, the program calculates the start and finish times for each activity so that the resource is efficiently used. Obviously, the program can't change the sequence of activities that are dependent on the completion of others, but it will speed up or hold back individual start times so the whole project can be completed as quickly as possible.

PM's fourth program is AON.BAS (AON stands for Activity on Node). It offers an analysis similar to those of the CPM.BAS program, except it assumes that activities take place on the nodes of a PERT chart rather than on the lines between them.

Overall, *PM* is an unsophisticated software package. It may be useful under limited circumstances, but you can't expect much from programs only 200 or 300 lines long. With all due respect to the work that went into it, this is the type of software you might find for $25 at a local user's group or even for free on an on-line bulletin board. **—Jared Taylor**

● *This network analysis chart from IIE's Project Management shows task start and end nodes, total and free float, and tasks on the critical path. An added feature is the calculation and display of the total project duration.*



PROJECT SCHEDULER 5000: A GRAPHIC TOUCH

PC FACT FILE

Project Scheduler 5000, Version 2.0
Scitor Corporation
256 Gibraltar Dr., Bldg. D7
Sunnyvale, CA 94089
(408) 730-0400
List Price: $395 with graphics; $345 without graphics.
Requires: 266K RAM, two disk drives, IBM color graphics board.

CIRCLE 781 ON READER SERVICE CARD

Project Scheduler 5000, by Scitor Corporation, provides an unusual combination of features among current market offerings: critical path analysis with powerful project cost and resource charting.

The program allows you to produce both histograms and line charts of important project data, such as labor and other resource costs. You can graph projected costs against current real costs at any point in the project. Moreover, its graphing feature is well integrated into the package, so the graphs are as easy as 1-2-3 to produce.

SIMPLE INSTALLATION

Although *Project Scheduler 5000* is copy protected, installation is simple. You must use the program disk at all times, but you do get a backup; no special initialization routine is necessary. I just removed the disk from the package and began running the program.

A tutorial exercise runs for several chapters in the reference manual and requires a little more than 2 hours to complete. It covers most of the important features of the package and is easy to follow because the keystrokes are clearly highlighted and the accompanying explanatory text is helpful.

The documentation is thorough, and many examples of screens are included in the manual. The manual is well organized and has an index. I found it was easy to find the answers to all my questions.

THE CASE STUDY

The case study required more preparation than with other programs and took about 2½ hours to enter because of the design of the case study, not necessarily because of the program itself. For example, each task in the case study is alphabetically labeled, and *Project Scheduler 5000* accepts only numeric entries in its task code field.

Another reason input of the case study took longer than with some other packages was that *Project Scheduler 5000* allows for extremely detailed entry of resource information on each task. You can define up to 96 different resources for each project, including cost per time unit, whether the resource is labor or nonlabor, and the number of units of the resource required for the duration of the task. This feature allows careful, realistic planning of resource allocation and budgeting.

One important feature that *Project Scheduler 5000* is missing is the ability to produce a network analysis diagram, or PERT chart, which was developed, after all, to facilitate an easy look at the "big" picture. However, aside from this shortcoming, *Project Scheduler 5000* produces a variety of helpful reports, such as a Gantt chart and a schedule of resources and costs.

You enter projects by filling in a number of fields for each task and then sending the information to a Gantt chart. Then the program redraws the screen after each task entry. This process slows down entry, but in real life, you would naturally pause to look up notations on the next task; there-

fore, the 5-second delay should not be frustrating in most situations. The program handles deletion, insertion, and addition of tasks well, making adjustments to the rest of the project as necessary.

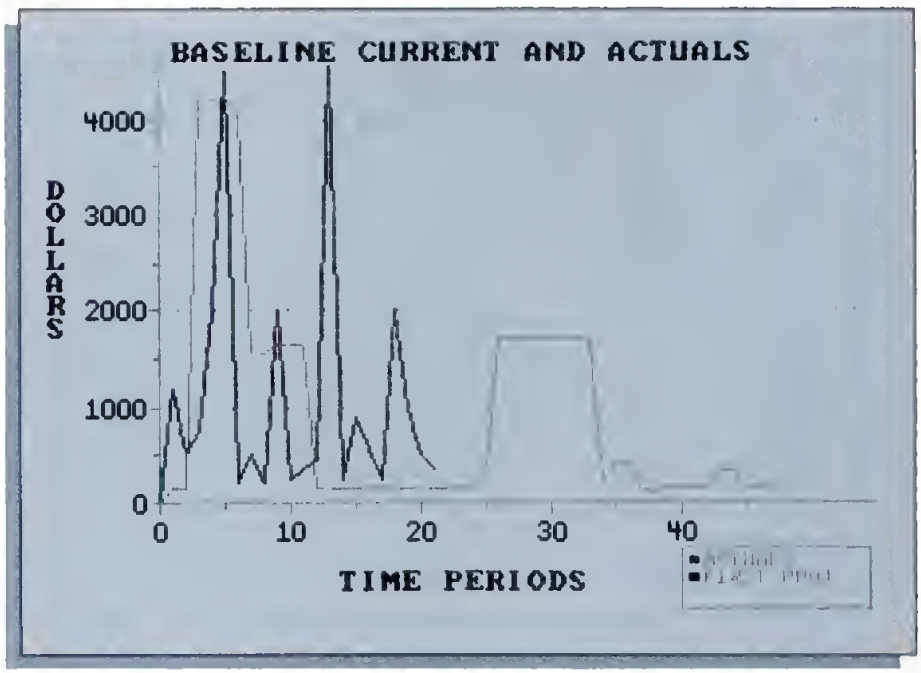
FEATURES

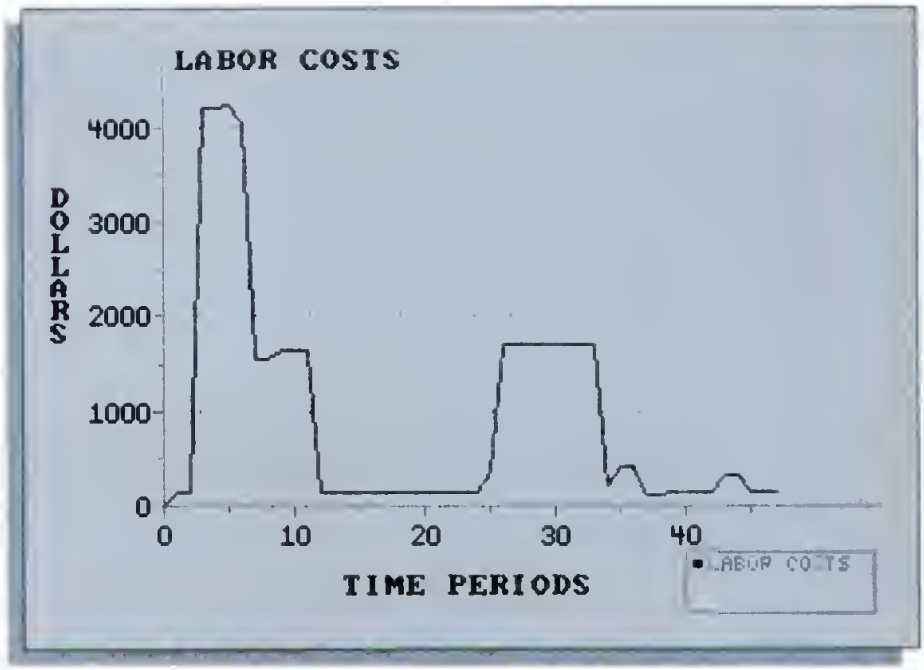
The report generation facility of *Project Scheduler 5000* is impressive because it's comprehensive and easy to use. Report selection is consistent with the rest of the program in providing menus for all the needed interactions. The reports include printouts of the work week definition and calendar for the project, a listing of all resources involved with the project and their related costs, a Gantt chart, a schedule of resources and costs on a time unit basis, and a listing of the total cost for each resource.

In addition, *Project Scheduler 5000* offers a Selectable Job Report option, which allows a wide variety of different analyses of project data. Project data can also be output in a DIF format for interfacing with a spreadsheet program.

The graphing facility of *Project Scheduler 5000* offers some interesting options for presentation of project data particulars. The main graphics menu lets you choose submenus to input actual costs for a project, specify the colors you want to use in your graph, and choose the graph type.

You can graph resource allocation units—that is, the number of resources of each individual type—by time period, either for the entire project or for a specified time period. You can also graph





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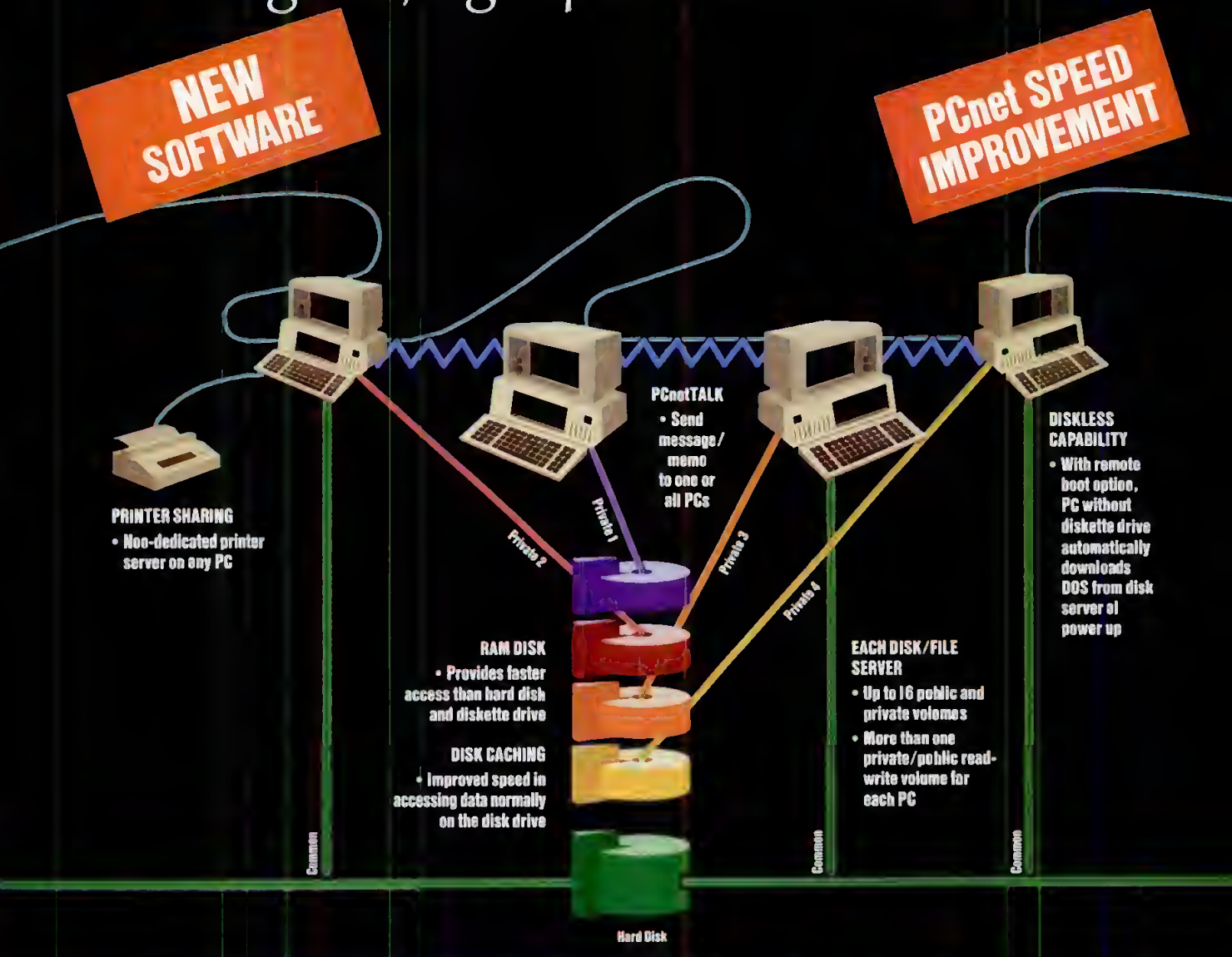

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CIRCLE 412 ON READER SERVICE CARD

resource costs, with labor costs either included or in a separate graph.

Once you input actual costs, several interesting graphing options become available, including planned project costs versus actual costs. The remainder of the project costs are projected based on actuals. You can also graph a comparison of period-by-period costs for the baseline plan, a revised plan, and actual costs to date.

Graphs are displayed on screen and can be sent to a printer or plotter with a few keystrokes. This graphing facility provides a powerful planning tool to help monitor the progress of a project. It is much easier to analyze detailed comparisons of financial data using graphics than it is to strain your eyes on reams of spreadsheet-type printouts.

PROJECT SCHEDULER 5000 IS AN EASY-TO-USE PROJECT PLANNING PACKAGE WITH TRULY OUTSTANDING GRAPHICS CAPABILITIES. IT EFFECTIVELY USES THE CRITICAL PATH METHOD.

AN EASY-TO-USE PACKAGE

Project Scheduler 5000 is an easy-to-use project planning package with truly outstanding graphic capabilities. The package does not do network analysis but effectively uses the critical path method. *Project Scheduler 5000* is a good package for you to consider purchasing if its features meet your project planning needs.

—Diane Burns

TARGET TASK: ANSWERING THE 'WHAT IF'

PC FACT FILE

TARGET TASK, Version 2.21
Comshare, Inc.
5901 B Peachtree Dunwoodie Rd.
#275
Atlanta, GA 30328
(404) 391-9012
List Price: $329
Requires: 128K RAM, one disk drive.

CIRCLE 791 ON READER SERVICE CARD

Answering "what if" questions is one of the microcomputer's most valuable assets. Planning a complex project on paper, preparing a Gantt chart, and writing management estimates are useful planning exercises, but using a computer to answer "what if" questions prepares you for the real world of late deliveries and broken promises. *TARGET TASK*, distributed by Comshare, Inc., can help you answer "what if" questions about the monetary and schedule impacts of changed deadlines and late or early deliveries.

The *TARGET TASK* manual is written clearly and includes both a practical guide to program planning and PERT chart construction and clear descriptions of the various portions of the program. Screen displays and reports are provided along with the text describing your options. Sample models, internal glossaries, and an excellent index are also included, but you may not need to reference them since the program itself has good prompts and well-designed screens.

THE PC MAGAZINE PROJECT

TARGET TASK is menu-driven. Menu presentations are well organized and include help screens for every option.

The data entry screen gives you a clear picture of information you must supply for

a given project task. Each entry is checked for validity. If you repeat an entry, an error message tells you that an identical path exists. The only negative feature of the input screen is that you can't back up and see the tasks you entered previously. Reviewing your work is useful, for example, if you are interrupted and lose your place in the task list. The screen will tell you how many inputs you made, but nothing beats seeing your previous work.

When you enter tasks into *TARGET TASK*, the program asks for optimistic, normal, pessimistic, and crash completion times. It also asks for an estimate of the average cost to complete a task and the cost of a crash effort. These various estimates will allow you later to contract or expand the schedule and see the results in time and dollars. As I went along, I made up estimates of the effectiveness and cost of expediting tasks in the PC model. If you build a model using *TARGET TASK*, it is well worth the effort you will expend to develop good estimates of the various timing and cost factors.

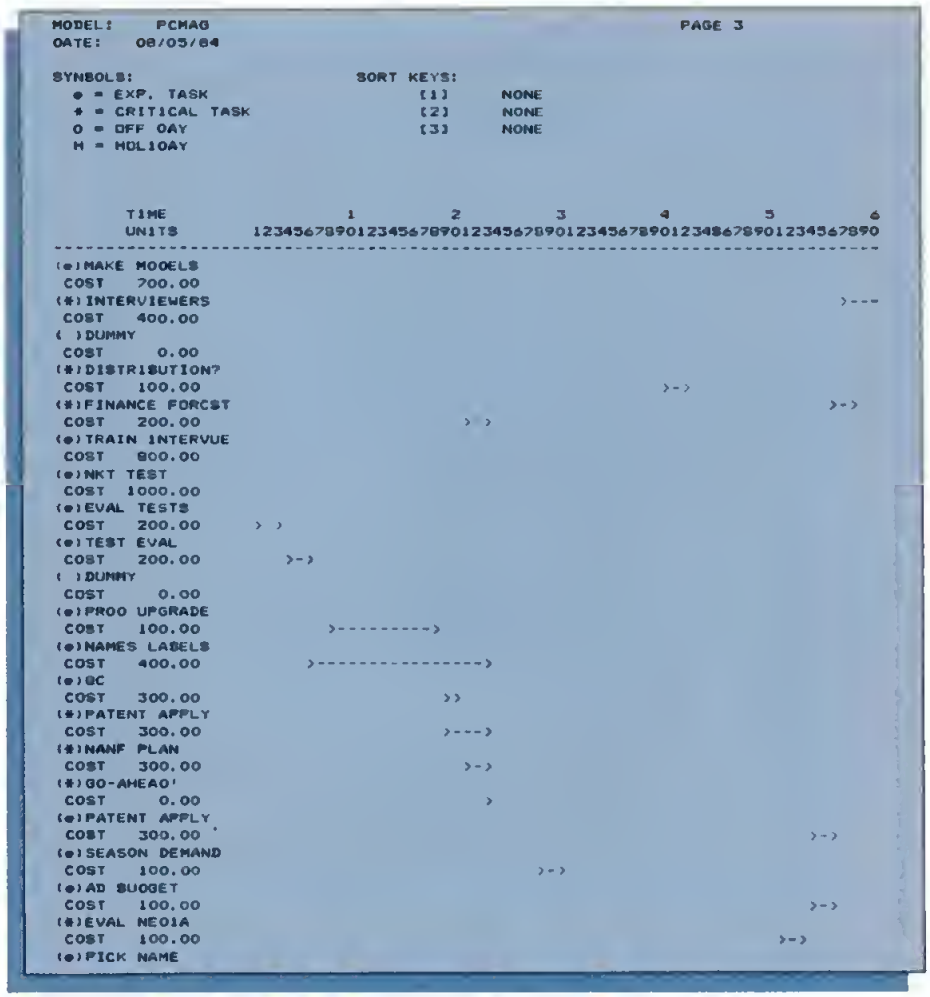
The *TARGET TASK* software can't project manpower requirements, print PERT charts, or directly show the funding schedule, but it does give you a good picture of what will happen to your project if you compress or extend the completion dates. *TARGET TASK* produces the task list, Gantt charts, and a comprehensive management report. The changes specified in the PC project were easy to make. You use the original numbered task nodes in your model to specify the tasks you want to change or delete. The Gantt chart was recalculated in a matter of seconds.

● TARGET TASK *distinguishes critical tasks with an asterisk in the left-most column.*

The program accepted the holiday schedule and, indeed, it comes with the major holidays already built in. The only anomaly I found was that the calendar in *TARGET TASK* would not accept the 1968 starting date specified for the PC model. The authors apparently did not expect you to chart anything that happened before they wrote the program.

TARGET TASK takes quite a while to prepare its management report. The program computed and printed for about 40 minutes while it described the details of each task. It also came up with the maximum number of days the task could be delayed without affecting the completion date of succeeding tasks.

Each time you run the *TARGET TASK* software, it displays a series of cost/time values. This list shows you how much it would cost to complete the project within a certain time based on the expediting



charges you entered into each task. The list shows various combinations of the most pessimistic and optimistic predictions. When you generate the Gantt chart and management report, you can select one or more specific times from the list and generate charts based upon these advanced or compressed schedules. You can perform "what if" exercises with the project by changing the optimistic and pessimistic dates and costs for specific tasks, generating the model, and then printing charts for various maximum time periods. Each one of the charts generated for a selected period will display reduced float times and changed costs.

HARDWARE REQUIREMENTS

TARGET TASK will run in a system with as little as 128K RAM and one disk drive. The number of tasks you can enter is limited only by the RAM size of your computer. The program displays the number of tasks it can accept on the top of the input screen. When the program ran in my 512K PC, it could take 531 tasks.

The PC-DOS version of *TARGET TASK* does not use the PC special function keys, color, or graphics. It can print its charts on any 80- or 132-column printer including daisywheel or thimble machines. The program is not copy-protected and it runs well on a computer equipped with a hard disk. Files can be saved and loaded from any drive in the system, project directories can be displayed, and existing files can be erased.

TARGET TASK is well-designed and well-written software. The screens effectively guide you through the operation, and the program forgives errors. At $329 it is fairly priced and will allow you to perform real "what if" studies of your project.—**Frank J. Derfler, Jr.**

TASKPLAN: WHAT DO YOU WANT FOR FREE?

TaskPlan
Williams Software & Services
1114 Pusateri Way
San Jose, CA 95121
(408) 227-4238
List Price: Free (send disk and self-addressed, prepaid mailer); $20 contribution suggested.
Requires: 96K RAM.

CIRCLE 745 ON READER SERVICE CARD

TaskPlan is little threat to mainstream project management programs. The spare-time creation of San Jose engineer C. Lamar Williams, *TaskPlan* records a project of up to 50 tasks spread over 60 time periods, calculates costs for each time period, keeps a running tally of all project costs, and provides a histogram of the results.

Unfortunately, *TaskPlan* focuses on tracking expenses and neglects the broader area of managing personnel, materials, and deadlines. Most users will find that this lack of features precludes using the program for serious project planning.

TaskPlan is available for the asking. Send a disk and a prepaid mailer to Williams Software & Services, try it out, and, if you like it, send along $20.

INSTALLATION

There are no instructions for installation; it's a straightforward process. Copy the two files from the original disk (TASKPLAN.BAS and SAMPLE.TPN) onto a working disk, copy BASICA from your own DOS disk onto the working disk (or issue a PATH command pointing to the directory containing BASICA if you have DOS 2.0/2.1), and you're in business. Elapsed time: about 3 minutes. To start *TaskPlan*, type BASICA, hit Enter, and load TASKPLAN.BAS.

TaskPlan requires one disk drive and 96K RAM. Color or monochrome monitors work equally well; there are no graphics except for the PC's monochrome graphics characters on some of the introductory screens. All printed output uses the first 128 ASCII characters, so no special graphics printer is required.

No tutorial is provided with *TaskPlan*, but loading the eight-task sample file and manipulating the sample data for an hour or two will give you a feeling for how *TaskPlan* works.

TaskPlan's documentation consists of a 14-line label on the disk envelope and two screens of information that appear each time you boot the program. The screens should be printed out with the Shift-PrtSc combination. Even by free-but-send-a-few-bucks-if-you-like-it software standards, that's a bit Spartan.

THE CASE STUDY

After loading *TaskPlan*, the user is prompted for a general project name, the number of tasks (2–50) and time periods (2–60), a choice of normal rounding or "conservative" rounding (where any number with a fraction is rounded upward), and two cost multipliers. The M1 multiplier can be fixed or allowed to vary task-by-task (to allow for extra overhead on some tasks). Using the M2 multiplier rounds the costs you input into different output costs; for instance, using .001 as the M2 multiplier converts dollars into thousands of dollars for rough eyeballing of expenses. Using conservative rounding and a .001 multiplier, a $5,420 cost would be rounded up to $6(000).

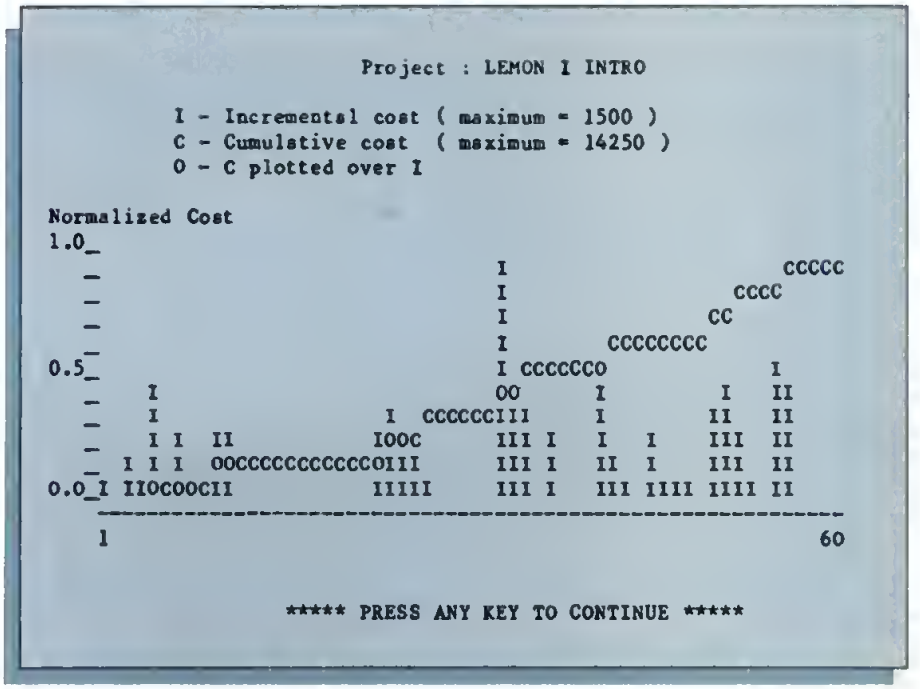
Tasks can be entered on a data-entry screen in groups of ten. Each task gets a name of up to 20 characters, a start time ranging from 0 to 59.99 (*TaskPlan* allows scheduling in terms of up to 60 user-specified time units), an end time ranging from greater than the start time to 60, a cost (up to $9,999,999.99, or higher using exponentiation), and a cost multiplier if a task-by-task multiplier was chosen. *TaskPlan* lacks full-screen editing; mistakes within a field can be corrected by backspacing if the Enter key hasn't been hit yet. Otherwise, you have to wait until after you've entered a group of ten tasks, at which point *TaskPlan* offers a chance to correct typing or data-entry errors. The process is sluggish and a bit awkward.

Once all tasks have been entered, *TaskPlan* allows the data to be saved to disk and calculates and displays costs for each of the 60 time periods and cumulative costs. Optionally, a histogram of the results is available that shows incremental costs (I), cumulative costs (C), and C/I.

Finally, *TaskPlan* offers to print the raw data, a cost summary, and a histogram.

I chose to use weeks for the time periods, where each work day amounted to .2 units (one-fifth of a week). For instance, a 6-day project beginning on a Tuesday might stretch from time period 5.20 to 6.40. Even so, the case-study data had to be spread over two files because it exceeded *TaskPlan*'s 50-task limit and required over 60 week-long periods.

From start to finish, the project took about 3 hours. That included a necessary side trip into Lotus's *1-2-3* to generate a calendar that showed the dates corresponding to the 60 weeks beginning at



● Task/Plan *plots incremental and cumulative costs for a project with a duration of 60 time periods.*

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Pmate was designed for programmers. We'll wager that you cannot find a programmer who has discovered Pmate and moved on to something else.

Pmate is a full screen editor with ten auxiliary buffers for squirreling away pieces of text until needed. It uses single key commands to move the cursor, or text, or insert or delete, or rescue several thousand characters of deleted text.

It has a format mode for tab setting or wraparound and shaping when it's time to write documentation. Pmate lets you assign chains of commands or strings of text to single keys: one keystroke could set up the entire shell of a new C function, for example.

Pmate has variables, if-then statements, loops. It calculates, and converts decimal to hex to binary and back. You can write compact programs (called "macros") to delete comments, for example, or check syntax, or process long sequences of commands. Macros can alphabetize lists, do row and column math, perform a series of operations on multiple files, even summon other macros.

Put another way, Pmate is a text editor with its own built-in interpretive language. A language you can use to completely customize this text editor to your fancy. Possibly the most artful, ingenious program you have ever seen.

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Unlike other linkers, the overlay manager acts on its own, needing no calls from the source program. Instead, Plink86's straightforward overlay description language allows you to describe your overlay structure in one place in your program — a structure

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Plink86 is a two pass linkage editor. On the first reading it determines all modules which need loading, to insure greater flexibility in assigning memory segment addresses before the disk file is created on the second pass. It can even sub-divide its linked output into multiple files for programs which must span more than one disk.

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CIRCLE 310 ON READER SERVICE CARD

week 0 for February 15, 1968, the starting date for the case study. The project should have taken less time, but a glitch on the very last entry of one file sent *TaskPlan* into a tailspin, so I had to enter the data again. Here's what happened: I inadvertently entered 60.00 as the start time for the last task. A checking routine requires the end of each task be at least .01 time units later than the beginning time. But (Catch 22!) another routine allows no time greater than 60.00. Unable to conjure up a number at least .01 greater than 60 and yet not more than 60, and unable to back up a step in the data entry, I had only one solution: to reboot the system.

A task can be deleted by inserting a dummy task with a cost of 0 and minimal time (.01 units) in its place. Moving the task is accomplished by changing start and end times; since *TaskPlan* doesn't sort by date, there's no need or easy way to move the physical location of a task within the data file. To add tasks, you must rerun *TaskPlan*, choose the "Use previous project" option, and add the tasks.

Of all the reports one might expect from a well-rounded project manager, *TaskPlan* generates only the task list (unsorted), an incremental and cumulative costs list (a funding schedule), and a histogram. Gantt and PERT charts, holiday schedules, resources lists, and manpower loading charts are beyond its realm.

SPECIAL FEATURES

As might be expected of a free program written in BASIC, there are few bells and whistles.

One unadvertised feature is that *TaskPlan* data can be generated using the nondocument mode of a word processor or even a database that can convert its output to comma-delimited files. If you did find a continuing use for *TaskPlan*, this would considerably speed up the data-entry procedure.

Each task would be entered like this (alphabetic entries must be surrounded with quotation marks):

"Task name," start time, end time, cost<Enter>.
Variable cost multiplier (if used) <Enter>.

Precede the task data with this header:

"Project name," number of tasks, number of time periods, "N" or "C" (for normal or conservative rounding), "C" or "V" (for a constant or variable M1 cost multiplier), actual M2 cost multiplier<Enter>.

OPINION

TaskPlan begs the question: "Why does this program exist?" If you're serious about managing a project, the time needed to use the program quickly outweighs the attractiveness of its low price. What you get out of *TaskPlan* might be less than the effort you have to put in.

TaskPlan addresses only a limited area of project management: recording and tallying costs when you already have a good idea of what the costs will be. Any self-respecting spreadsheet or database could do the same work, but without pausing to catch its breath or suffering the artificial restraints of 50 tasks and 60 time periods.—**William K. Howard**

VISISCHEDULE: QUICK, CLASSY, AND COLORFUL

VisiSchedule, Version 1.2
VisiCorp
1953 Lindy Ave.
San Jose, CA 95131
(408) 946-9000
List Price: $195
Requires: 128K RAM, two disk drives.

CIRCLE 782 ON READER SERVICE CARD

VisiSchedule is a fast, interactive, visually oriented project planning and scheduling program that is loaded with features. It is fully menu-driven and produces four comprehensive reports, either on the screen or on the printer.

Installing *VisiSchedule* is simple. The system disk is copy-protected, so all you need to do is copy over the system files from DOS if you would like to make the disk auto-booting. A booklet entitled *Getting Started* explains how to use *VisiSchedule* both with floppy disks and with a hard disk.

The package also includes a simple and effective tutorial, entitled *Quick Course*. It guides you through the steps needed to put a small project on the system and to print out reports. In 40 minutes, *Quick Course* explores all the major features of the program.

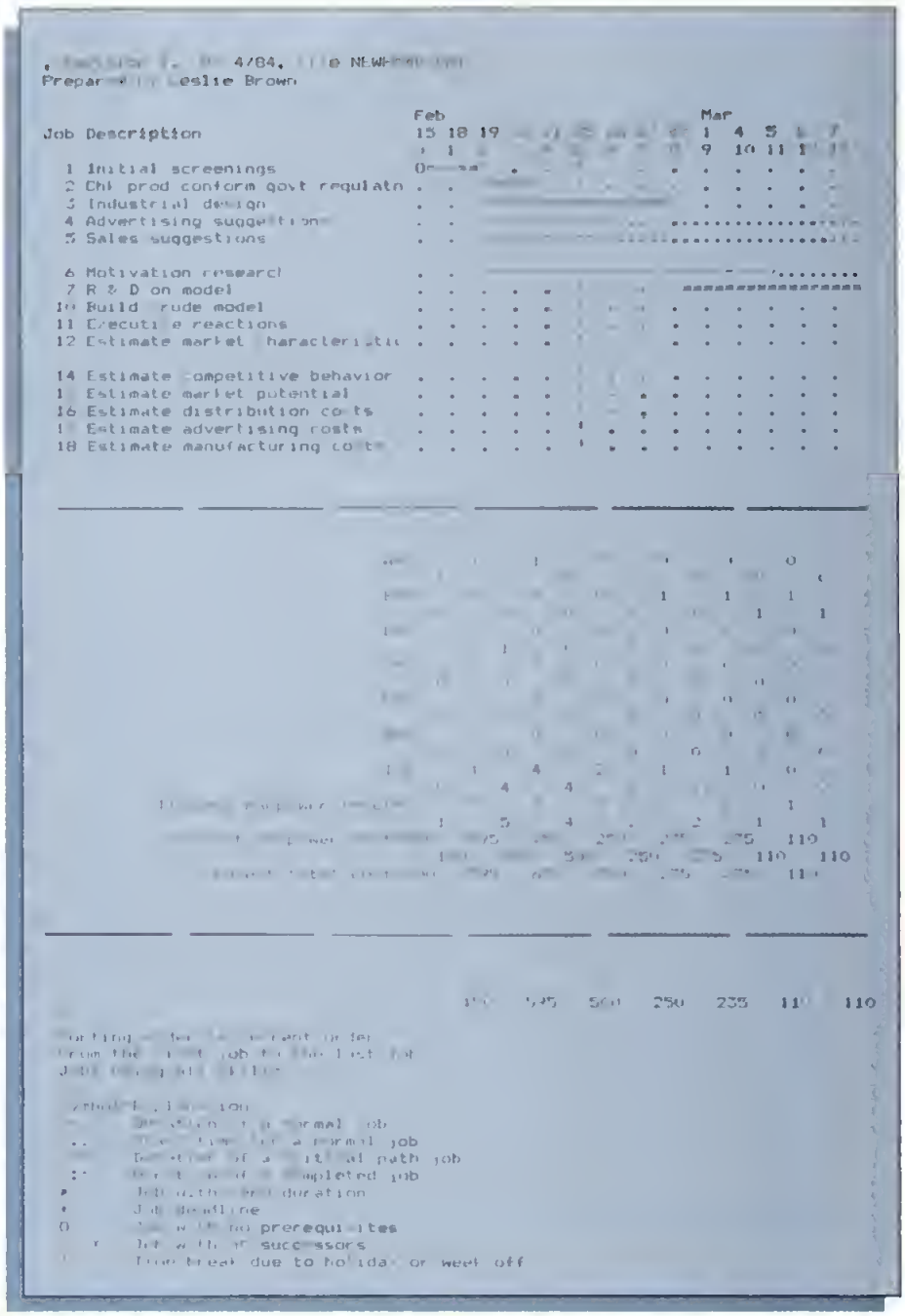
The rest of the documentation is just as good. The *Reference Guide* thoroughly describes all the program features, while the *Pocket Reference* serves as a handy reminder of the options and commands once you are familiar with the program. All of the documentation reads well and tells you what you want to know. The many illustrations show you what to expect on the screen when you select a command.

The case study took me about 3½ hours. Of that time, I spent only a little over an hour entering information. All of the rest of my time was spent printing reports.

REPORTS

VisiSchedule produces only four reports, but they are nicely designed and show a lot of information in a handy and usable way. For each job, the Job Description report shows the job number and description, job length, earliest and latest start and finish dates, slack time, prerequisite jobs, manpower required by skill category, the computer manpower cost, the direct cost, and whether or not the job is on the critical path. Printing this report for the 60 or so tasks in the case study took 20 minutes on my Epson MX-80 printer.

The other large report is the Schedule



● *VisiSchedule combines manpower loading and cash flow data on its Gantt chart.*

Graph, which is primarily a Gantt chart showing the calculated schedule for the project. Following the Gantt chart and using the same time scale, the report shows the manpower level required for each skill, the labor cost, the direct cost, and the total cost per time unit. *VisiSchedule* prints several sheets of paper as a single report "page" listing all the jobs in the project. It prints as many of these "pages" as needed to show the full time for completing the project. I found that printing this report for the case study took 17 minutes.

VisiSchedule produces two other reports, both much smaller. The first is a one-page Project Description report. It shows a summary of the job schedule, the manpower skill categories, and the holiday schedule. The second is called the Tabular Job report. It prints a single line per job—you select the information you want and the sequence. The only limitation is that the fields you select must fit across an 80-character report line. Together, these reports take about 4 minutes to print.

VisiSchedule did a good job of producing the information called for in the case study, but its reports did not coincide with the reports *PC* requested. *VisiSchedule* does not have a separate resource list, funding schedule, manpower loading chart, or holiday schedule. All of these items are incorporated into the Project Description report and the Schedule graph.

EASE OF USE

Adding, deleting, and inserting tasks took no discernible processing time. The only delay in these operations was caused when the screen was refreshed to show the updated task list.

VisiSchedule's nested menus make working with the program very easy. It presents information pertinent to the current function in the top 20 lines of the screen. The available program options occupy the next three lines. The next-to-last line is used to display messages, and the last line for data entry. To select an option, you move the cursor over the option and press Enter or just type in the first character of the word shown in the list of options. *VisiSchedule* draws the Gantt chart of the schedule on the screen as you enter information for the various jobs that make up the project. These screen features minimize the amount of typing and maximize the amount of relevant information in view.

VISISCHEDULE HAS MANY NICE FEATURES. THE ONLY MISSING FEATURE I CAN THINK OF IS ONE THAT WOULD ALLOW YOU TO SET A MAXIMUM NUMBER OF PEOPLE AVAILABLE WITH A GIVEN SKILL, A COMMON REAL-WORLD CONSTRAINT THAT THE PROGRAM CANNOT HANDLE.

I did have to do some preparation before starting the case study. *VisiSchedule* numbers the jobs—you give each job a description, but you do not control the number assigned. In the case study, the tasks are named by the originating and terminating nodes. Since I couldn't make use of this naming system, I had to renumber the tasks in order to build my own listing of dependencies and anticipate *VisiSchedule*'s number approach; it does not force you to draw a network diagram.

VisiSchedule lacks the capacity to handle the case study in two areas. First, it cannot handle fractional periods of time. You may use either days or weeks as your time unit, but you cannot enter a job shorter than one full unit. And second, *VisiSchedule* has only eight skill categories. The case study required more. To work within these limitations, I allocated a full day to each of the half-day tasks and grouped many responsibility codes into skill category 9 as a catch-all.

VisiSchedule has many nice features that I did not need for the case study. For example, it uses color very well; if you don't like the colors the program uses, you can change them to suit yourself. Also, *VisiSchedule* can interface with any program that can use a DIF file. In addition, more than one skill and more than one person can be assigned to a job. The program will use the salary rate for each skill to compute labor costs for the jobs. All reports can be previewed on the screen before printing. And for the job-oriented reports, you may select both the jobs to be included and the sequence.

The only missing feature I can think of is one that would allow you to set a maximum number of people available with a given skill, a common real-world constraint that the program cannot handle.

In summary, I think that *VisiSchedule* is an excellent project management program. It is quick, colorful, comprehensive, and classy. It certainly is one of the best Level I systems covered in this study.—**Leslie K. Brown**

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NAME	HARDWARE REQUIREMENTS			DOCUMENTATION	
	MEMORY	NUMBER OF DISK DRIVES REQUIRED	FIXED DISK REQUIRED	HAS TUTORIAL	GIVES SAMPLE DATA
THE CONFIDENCE FACTOR	128K	1, but 2 recommended	NO	NO	YES
DECISION SUPPORT SYSTEM	256K	1	NO	NO	YES
GANTT-PACK	128K	1	NO	NO	YES
MICROSOFT PROJECT	128K	1	NO	YES	YES
MORGAN PATHFINDER	128K	1	NO	NO	YES
PERTMASTER	128K	1, but 2 recommended	NO	YES	YES
PRO-JECT 6	128K	1	NO	YES	YES
PROJECT MANAGEMENT	64K	1	NO	NO	NO
PROJECT SCHEDULER 5000	256K	2	NO	YES	YES
TASKPLAN	96K	1	NO	NO	YES
TARGET TASK	128K	1	NO	Has examples	YES
VISISCHEDULE	128K	2	NO	YES	NO

SYSTEM CAPACITIES

NUMBER OF RELATED PROJECTS	TASKS PER PROJECT	LEVELS OF HIERARCHY	RESOURCE CATEGORIES	SCHEDULING UNITS	MAXIMUM $ AMOUNT	TASKS DISPLAYED SIMULTA-NEOUSLY
1	100	1	10	User defined time units	$10,000 per resource/time unit	20
1	Depends on graph generated	1	Not applicable	Weeks, months, quarters, years	$999,999	Depends on graph generated
1	Limited by memory	2	Not defined	Days, hours, or user-defined units	Not applicable	9–10
Limited by disk capacity	128	Limited by disk capacity	64 per project, 8 per task	Days, weeks, or months	$21,000,000	19
1	3,160	1	Not defined	User-defined	Not applicable	16
Limited by disk capacity	1,000–2,500, depending on memory	1	29 per task	User-defined	User-defined units	19
1	75–250, depending on memory	1	30 per project, 5 per task	Days, weeks, or months	Billions	13
1	PERT chart, 300; Cntical Path chart, 500	1	1 per task	User-defined	Not applicable	14
Limited by disk capacity	500–750	3	96	99 divisions of day, week, month	$99,990,000	18
1	50	1	1 per task	60 user-defined units	10 digits	10
1	500	1	Not applicable	Days, or user-defined	10 digits	1
1	300 with 192K, 100 with 128K	1	9	Oays or weeks	10 digits	20 to 22

NAME	FEATURES				
	COPY-PROTECTED	MIXED PLANNING UNITS	CHANGES PLANNING UNITS	ON-LINE HELP	CRITICAL PATH HIGHLIGHTED
THE CONFIDENCE FACTOR	NO	NO	NO	Yes, context-sensitive	Yes, by letter C
DECISION SUPPORT SYSTEM	YES	NO	NO	Yes, context-sensitive and split-screen help	Yes, by dotted line
GANTT-PACK	NO	NO	YES	NO	NO
MICROSOFT PROJECT	YES	YES	YES	Yes, context-sensitive	Yes, by special characters
MORGAN PATHFINDER	NO	NO	NO	NO	Yes, by boldface and special symbols
PERTMASTER	YES	NO	NO	Yes, context-sensitive	User option—color, boldface, double-line, and others
PRO-JECT 6	NO	NO	NO	NO	Yes, by color on color screen, bold on monochrome
PROJECT MANAGEMENT	NO	NO	NO	NO	Yes, by asterisks next to activity
PROJECT SCHEDULER 5000	YES	NO	NO	YES	Yes, red on color screen, special characters on monochrome
TASKPLAN	NO	NO	NO	NO	NO
TARGET TASK	NO	NO	NO	Yes, menu	Yes, by asterisks
VISISCHEDULE	YES	NO	NO	NO	Yes, by double-line or color

INPUTS						
		DEFINES TASK DEPENDENCY				
CHARACTERS ALLOWED IN TASK DESCRIPTION	ALLOWS TASK ESTIMATES	AS PERCENTAGE OF TASKS COMPLETED	AS NUMBER OF TASKS COMPLETED	INSERTS TASKS	READJUSTS DEPEND-ENCIES	MULTIPLE BILLING RATES
20	NO	NO	NO	YES	YES	NO
24	NO	NO	NO	YES	NO	NO
30	NO	NO	NO	YES	NO	NO
30	NO	NO	NO	YES	YES	NO
27	NO	NO	NO	YES	YES	NO
40	NO	Yes, in time units	YES	YES	YES	NO
30	NO	NO	NO	YES	YES	NO
Numeric only	YES	NO	NO	YES	NO	NO
30	NO	NO	NO	YES	YES	NO
20	NO	NO	NO	NO	NO	NO
14	YES	NO	NO	YES	YES	NO
30	NO	NO	NO	YES	YES	NO

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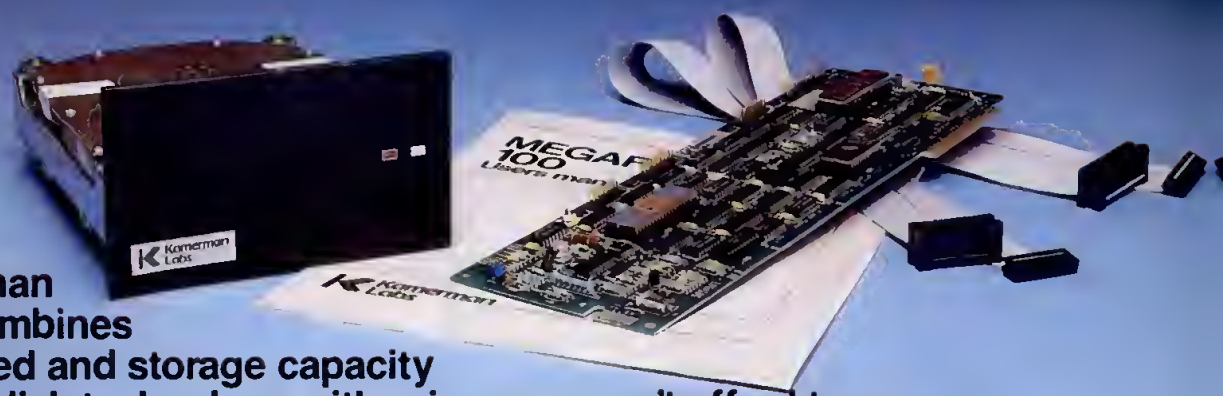

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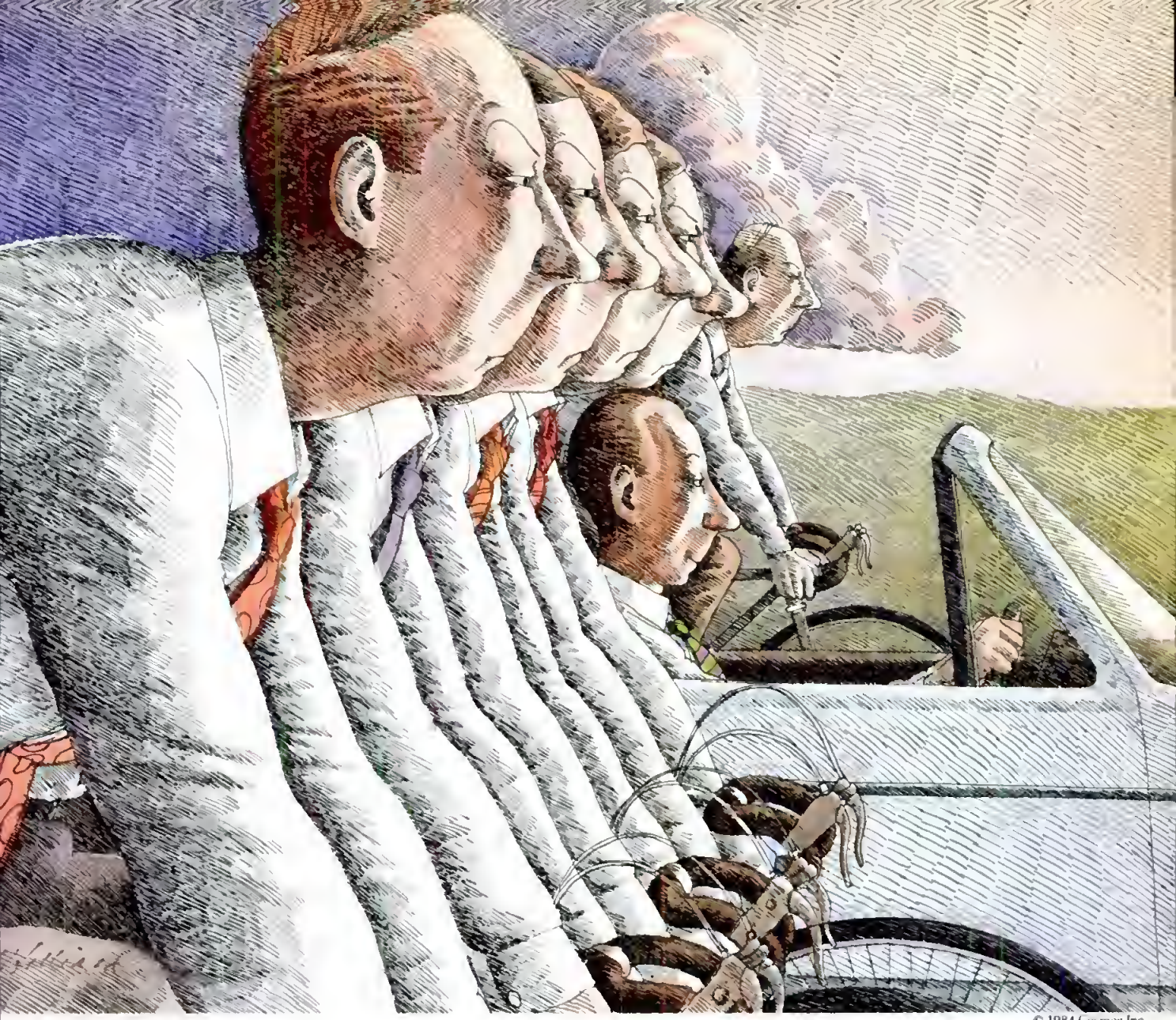

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NAME	OUTPUTS				
	PROJECT PLAN/TASK LIST	NETWORK ANALYSIS	GANTT CHART	PERT CHART	RESOURCE LIST
THE CONFIDENCE FACTOR	Yes, on screen and printer	NO	Yes, on screen and printer	NO	Yes, on printer
DECISION SUPPORT SYSTEM	Yes, on screen and printer	NO	Yes, on screen and printer	Yes, on screen and printer	NO
GANTT-PACK	Yes, on screen and printer	NO	Yes, on screen and printer	NO	NO
MICROSOFT PROJECT	Yes, on screen and printer	NO	Yes, on screen and printer	NO	Yes, on screen and printer
MORGAN PATHFINDER	Yes, on screen and printer	NO	Yes, on screen and printer	NO	NO
PERTMASTER	Yes, on screen and printer	Yes, on screen and printer	Yes, on screen and printer	NO	Yes, on screen and printer
PRO-JECT 6	Yes, on screen and printer	NO	Yes, on screen and printer	NO	Yes, on screen and printer
PROJECT MANAGEMENT	Yes, on screen and printer	Yes, on screen and printer	NO	NO	NO
PROJECT SCHEDULER 5000	Yes, on screen and printer	NO	Yes, on screen, printer, and plotter	NO	Yes, on screen and printer
TASKPLAN	Yes, on screen and printer	NO	NO	NO	NO
TARGET TASK	Yes, on screen and printer	Yes, on printer	Yes, on printer	NO	NO
VISISCHEDULE	Yes, on screen and printer	Yes, on screen and printer	Yes, on screen and printer	NO	Yes, on screen and printer

							VENDOR SUPPORT
	FUNDING SCHEDULE	MANPOWER LOADING	HOLIDAY CALENDAR	SUB-CONTRACTS	UPDATED PROJECT PLAN	UPDATED NETWORK ANALYSIS	HOT-LINE TECHNICAL SUPPORT
	NO	Yes, on printer	NO	NO	NO	NO	YES
	Yes, on screen and printer	Yes, on screen and printer	NO	NO	Yes, on screen and printer	NO	YES
	NO	NO	NO	NO	YES	Yes, on screen and printer	YES
	NO	Yes, on screen and printer	Yes, on screen and printer	Yes, on printer	NO	NO	YES
	NO	NO	NO	NO	NO	NO	YES
	Yes, on printer	Yes, on screen and printer	Yes, on screen and printer	Yes, on screen and printer	NO	NO	YES
	Yes, on screen and printer	Yes, on screen and printer	NO	Yes, on screen and printer	NO	NO	YES
	NO	NO	NO	NO	NO	NO	YES
	Yes, on screen, printer, and plotter	Yes, on screen, printer, and plotter	Yes, on screen, printer, and plotter	NO	Yes, on screen and printer	NO	YES
	Yes, on screen and printer	NO	NO	NO	NO	NO	YES
	NO	NO	Yes, on screen and printer	NO	NO	NO	YES
	Yes, on screen and printer	Yes, on screen and printer	Yes, on screen and printer	NO	NO	NO	YES

NAME	INTERFACING		BUYING INFORMATION		
	WITH OTHER FAMILY SOFTWARE	WITH OTHER TYPES OF SOFTWARE	LIST PRICE	DEMO VERSION AVAILABLE	AVAILABLE OUTSIDE OF U.S.
THE CONFIDENCE FACTOR	Yes, with *Project Master*	NO	$389	YES	YES
DECISION SUPPORT SYSTEM	NO	NO	$895	YES	NO
GANTT-PACK	NO	Yes, with Lotus's *1-2-3*	$395	YES	NO
MICROSOFT PROJECT	Yes, with *Multiplan* chart	Yes, with DIF, *dBASE*, SYLK	$250	YES	YES
MORGAN PATHFINDER	NO	NO	$80	YES	Canada
PERTMASTER	NO	NO	2,500 activities, $895, 1,500 activities, $695	YES	Only from company
PRO-JECT 6	NO	NO	250 tasks, $199 150 tasks, $149 75 tasks, $99	YES	Only from company
PROJECT MANAGEMENT	NO	NO	$170	NO	Only from company
PROJECT SCHEDULER 5000	NO	Yes, with DIF format output	$395 with graphics, $345 without	NO	YES
TASKPLAN	NO	NO	Free; $20 contribution suggested	NO	Only from company
TARGET TASK	NO	NO	$329	To dealers only	U.K.
VISISCHEDULE	Yes, to VisiCorp programs via DIF	Yes, with DIF format output	$195	NO	France

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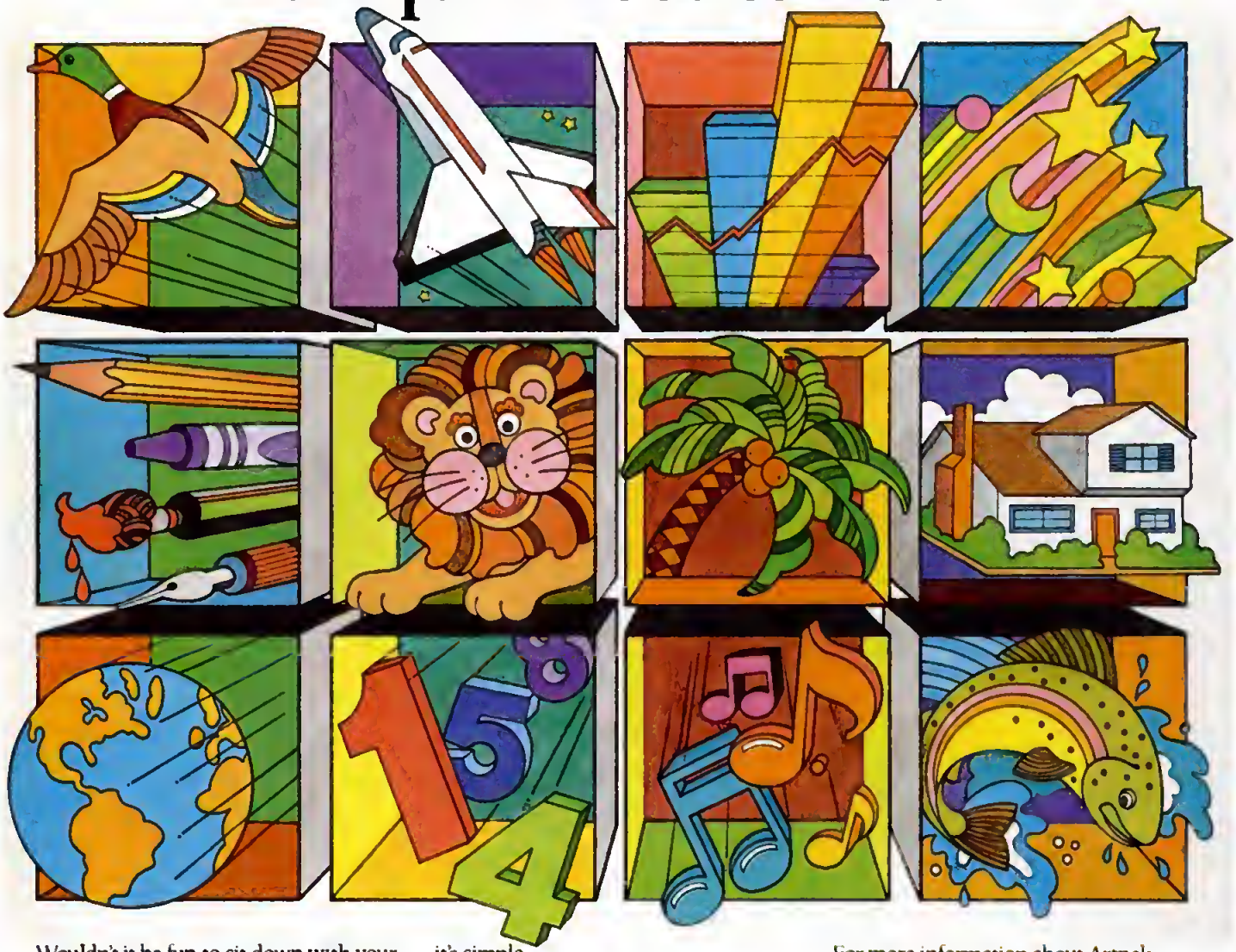

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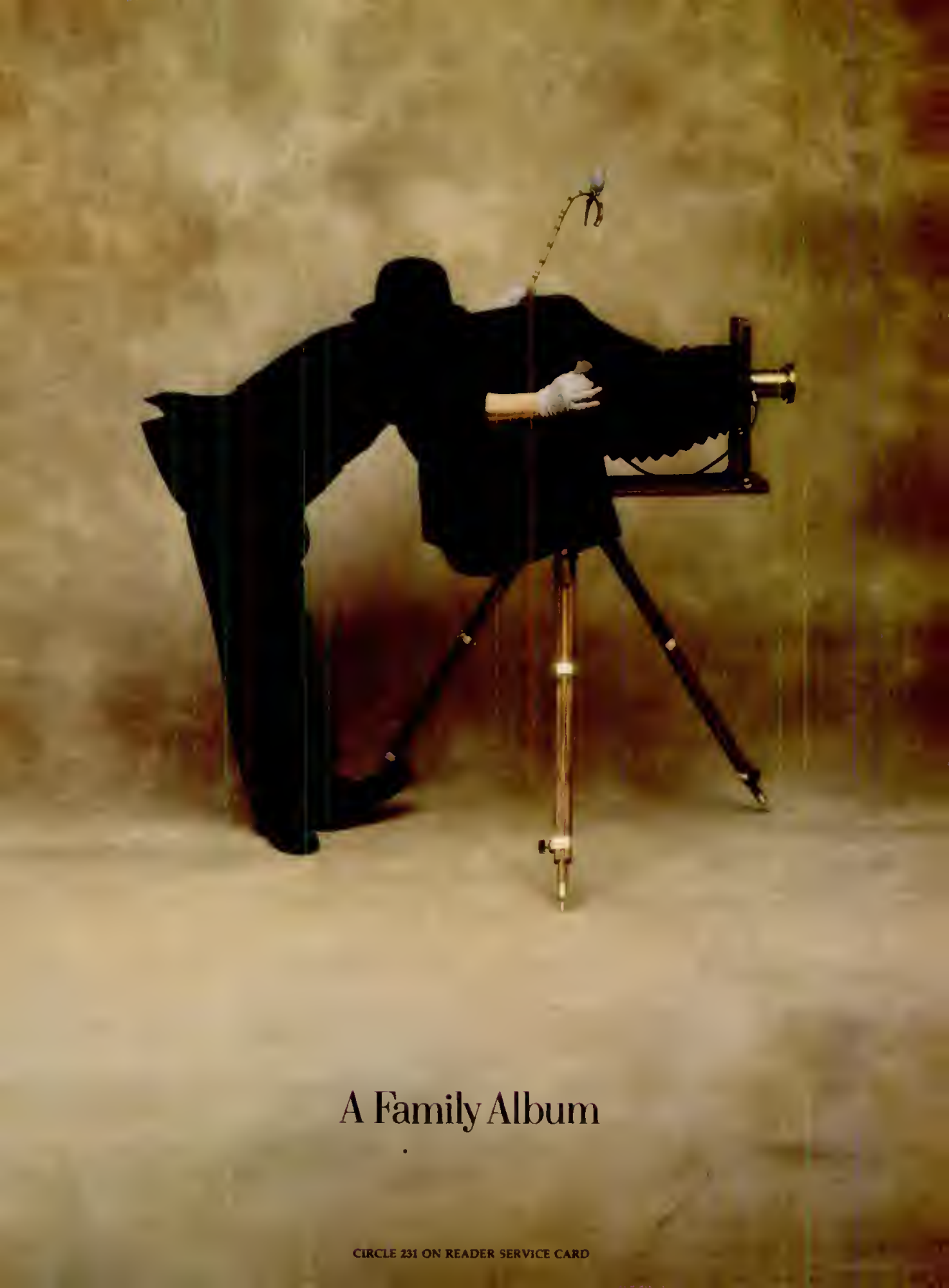

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Supercharged Turbo Pascal

This dynamic new language compiler is a "VolksPascal," with most of the power of Pascal plus a few extras. It introduces a new programming environment and runs like magic.

A Post Office poster warns against mail fraud, "If it sounds too good to be true, it probably is." I'll bet that many people recalled that warning as they read Borland International's first ads for Turbo Pascal late last year: a complete native-code Pascal language compiler with its own built-in *WordStar*-like full-screen text editor, the whole lot occupying 33K RAM and costing $49.95.

I didn't believe it either. Of course, I had reason, having just given up on JRT Pascal, which was offered for CP/M-80 computers 3 years ago at $29.95. The CP/M-80 world went crazy ordering it. The problem was, it was a terrible compiler. Besides doing great harm to the Pascal language definition, it was a bug farm, locking up my CP/M-80 computer several times an evening. Not surprisingly, JRT Systems went bankrupt late last year.

A co-worker had to shake me by the shoulders, urging me to get Turbo Pascal for my own PC. I finally ordered it. Three days after receiving it, I was a believer. Turbo Pascal will run on any PC with 64K RAM and a single disk drive. It will also run on the standard disk-based (but not cassette-based) PC*jr*. Although I have not tested Turbo on the PC*jr*, I have heard good reports from someone who refuses to program using anything else. Turbo's small size and compact output code files are very appropriate for the PC*jr*'s limited resources.

A language compiler is a tool you use to write programs. A programming environment is the whole interlocking process of bringing a program out of your head and into action on your computer. It includes the compiler and the compiler's support equipment: a text editor, debugger, linker, and so on.

The really magical thing about Turbo Pascal is that it applies a whole new concept in programming environments for PC-DOS. The distinction may be lost on those of you who do not program in a compiled language like Pascal or C; so let me first explain what a traditional programming environment is like.

You begin with an idea for a program. The first step is to plan the program carefully, making sure that you fully understand the program's purpose and its limits before trying to define its methods.

Once you've planned the program (possibly using an outlining tool like *ThinkTank*), you bring up a text editor (one somewhere on the spectrum from EDLIN to *WordStar*) and write a source program. This program is simply a text file, with words like

```
FOR X := 1 TO 100
  DO WRITELN(STRING
  _ARRAY[I]);
```

You then save your source program as a disk file, and exit the text editor back to PC-DOS.

Next you must execute a compiler program. A typical Pascal compiler is Digital Research's Pascal/MT+86. The compiler program reads your source file from disk and translates it into a "relocatable object file," which is written out to disk. This process can take a long time. Pascal/MT+86 can take nearly 10 minutes to compile large, complicated programs with several thousand lines.

The compiler program spots errors in your source program. If any errors exist, you must exit the compiler program to DOS, reload your text editor, and edit the errors out of your source program. You must repeat the edit/compile/spot errors cycle until you can find no more errors.

Next, you must "link" the relocatable object file into a program file that can be run. A linker program takes your relocatable file and fills in some blanks with standard library routines included with the compiler. You can load the file that it finally writes to disk and run it like any other computer program.

Of course, there's no guarantee that your program will run correctly. In fact, it may contain run-time errors, which can bring your PC to a sudden halt. In that case you must reboot the PC, bring up your text

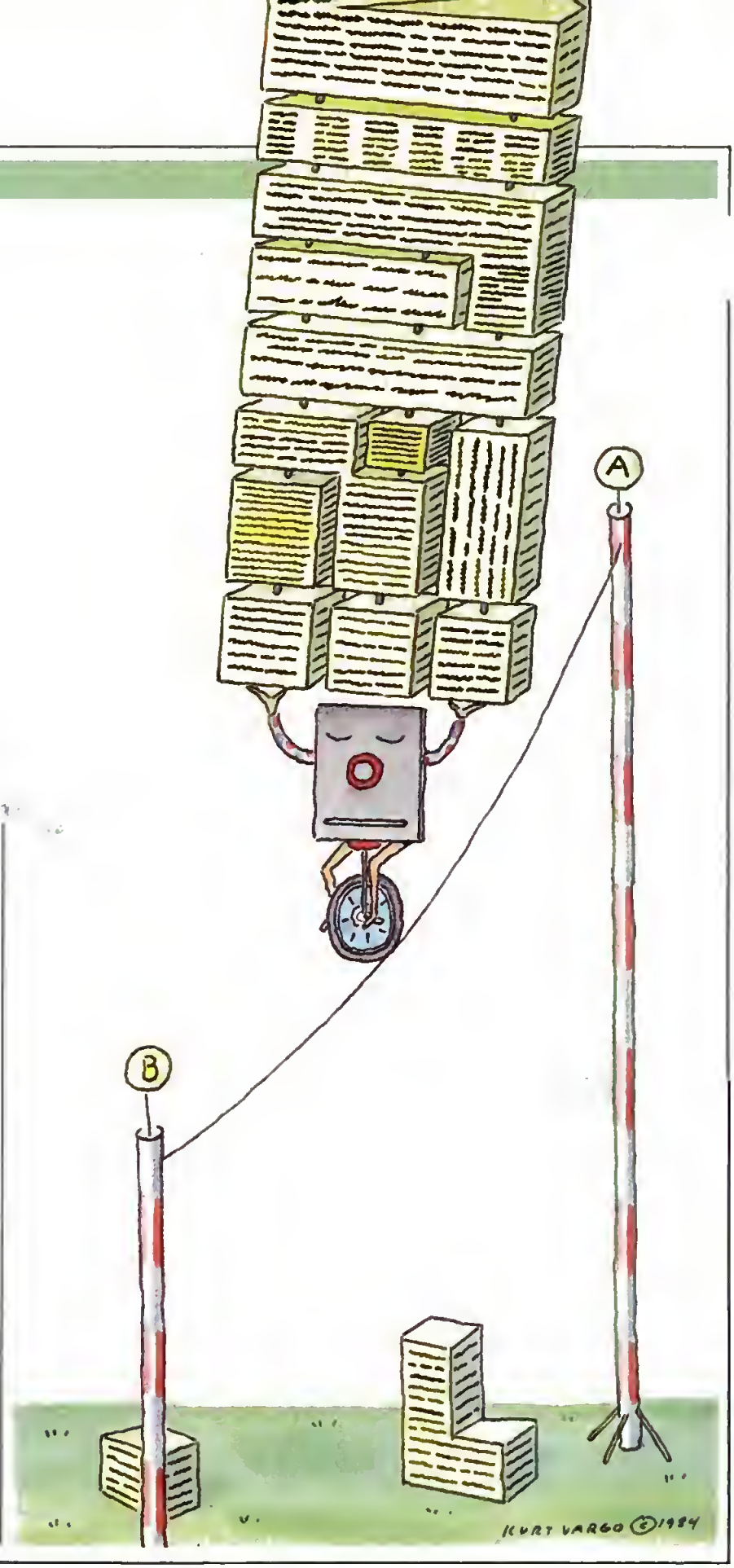

Illustration: Kurt Vargo

editor, and begin the cycle again.

In summary, you must plan, and plan well. Then repeat: Edit source; compile source. Continue until the compiler finds no more errors. After that, link the program with the necessary code libraries. Finally, run the program. If it fails, repeat the process.

My experience with Pascal/MT+86 has shown that a complete cycle takes a minimum of 3 to 4 minutes even for trivial 35-line toy programs. For a serious 1,000-line application, figure 15 to 30 minutes per cycle. Much of that time is spent staring helplessly at your machine as it grinds away writing intermediate files to disk—an odious waste of your time.

Everything You Need

Enter Turbo Pascal, a one-piece environment. A single PC-DOS program—TURBO.COM—has everything you need to create programs.

When you run TURBO.COM, a menu appears on your screen. The Turbo menu is the jumping-off place for the entire programming environment. You do not have to drop down into PC-DOS for anything. In fact, if you have at least 128K RAM, you can create and test small to middling programs without ever writing anything to disk. Subject to the limits of your PC's configuration, Turbo Pascal does everything within RAM. Your source program is in RAM. Your object program is in RAM. The editor is in RAM, as is the compiler. No disk I/O is required.

First off, that means fast. When you begin to edit a program, you don't have to wait for the program to load in from disk, configure itself, and finally appear on your screen. Press E and wham! you're editing your source code. A two-character *WordStar* command (good old Ctrl-K-D) brings you instantly back to the Turbo menu. Pressing S saves your edited source program to disk (not strictly necessary, but it's foolish not to save to disk after each change to your source). Pressing C compiles your source code into object code. Again, you do not load the compiler program from disk; it's already there, ready to begin crunching instantly.

The compiler is dazzlingly fast. Its speed is partly due to the fact that it's reading source from RAM and writing object to RAM; RAM is hundreds of times faster than floppy disks. But the compiler is obviously written by a true wizard of assembly code. In all my years using microcomputers (all the way back to 1978 and the days of the Compucolor II), I have never seen a compiler work so quickly. Even when writing a code file to disk, an easily selected menu option, it can compile a 1,000-line program in seconds. Small toy programs literally compile too quickly to follow in a second or less.

> Turbo Pascal's programming environment could apply to virtually any programming language.

Say the compiler locates an error in your program. Here's where some of the magic of the Turbo environment comes in: Press Esc and Turbo brings up its text editor, the cursor resting where it thinks the error lies. And the compiler is usually right.

Maybe you lost a semicolon or made one of those other famous Pascal errors. Three keystrokes can often fix it. Then it's Ctrl-K-D to the menu, and C to compile again. You can be out of the compiler, into the editor to fix an error, and back out to the compiler in less than 5 seconds.

In time your program will compile without errors. The compiler will then automatically bring you back to the menu. Press R and instantly your program is running. Once again, the magic environment comes into play: If a run-time error occurs, Turbo searches your source code for the location of the object-code error, brings up the text editor, and again puts the cursor where it thinks the problem lies.

That trick took my breath away. You can repair, save, recompile, and run a simple run-time error (spelling a file name incorrectly, for example) in as little as 15 or 20 seconds.

Once you have chased all the bugs out of your program, you can save the program file out to disk as a .COM file. Then you don't need the Turbo environment anymore to run the program; simply call the program from DOS as you would any other .COM program. There's no p-code interpreter program hanging like an albatross from your own program's neck, as with UCSD Pascal.

About one-third of the speed of the Turbo programming environment is due to its working from RAM to RAM. Another third comes from not having to duck out to PC-DOS after executing each programming tool. The final third is the result of the excellent software engineering that went into the design of the Turbo product.

Nothing like Turbo Pascal has ever existed for PC-DOS before. The only thing that even comes close is PC BASIC.

Pascal Isn't BASIC

Turbo Pascal's programming environment could apply to virtually any programming language. Nothing in it is tied to Pascal. In fact, Borland International has made no secret of its development of a Turbo C and a Turbo Modula 2 system for release later this year, and we can expect them to operate within a similar program-

Turbo Pascal V2.0
Turbo87 Pascal V2.0
Borland International
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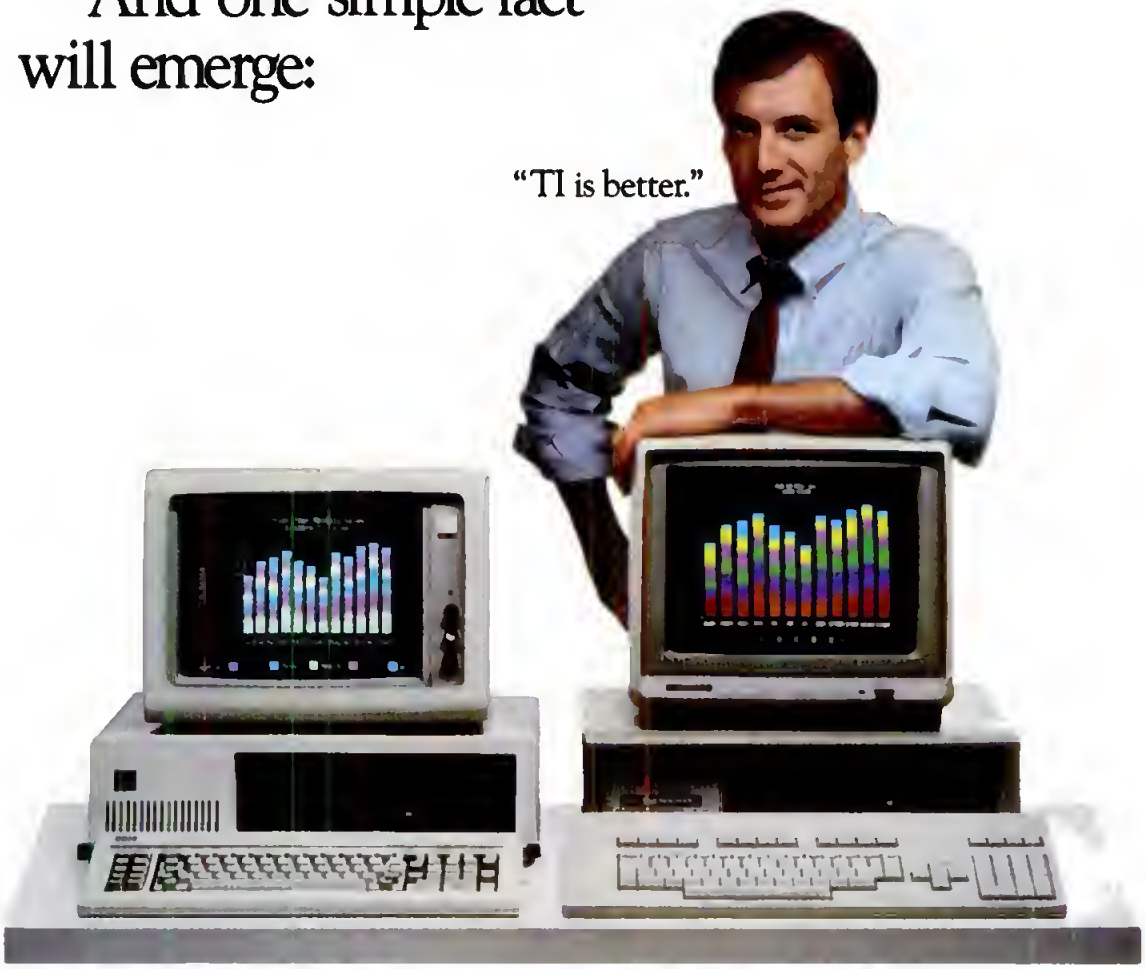

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2764-48

ming environment. For now, however, we have Pascal.

What *is* Pascal? As a block-structured programming language, Pascal (unlike BASIC, which is line-structured) is organized into "blocks." These blocks are sequences of instructions framed within BEGIN/END keywords. All Pascal programs have a common structure: A single program block at the bottom of the program invokes function and procedure blocks, which are defined above it in the

After Turbo, the Deluge

Vendors have had a field day scrambling to release products to enhance and explain Turbo Pascal. Here are the best so far.

It happens frequently enough in our whirlwind industry: A successful software product spawns enhancements, add-ons, and publications by third-party vendors reaching for a piece of the action. But never before have so many people climbed on the coattails of something so arcane as a Pascal compiler.

PC FILE CODE

Turbo Toolbox
Borland International
4113 Scotts Valley Drive
Scotts Valley, CA 95066
(408) 438-8400
List Price: $49.95

CIRCLE 739 ON READER SERVICE CARD

MetaWindow
Metagraphics
444 Castro St., Suite 400
Mountain View, CA 94041
(415) 964-1334
List Price: $150

CIRCLE 738 ON READER SERVICE CARD

TUG Lines
John Craig, Editor
P.O. Box 548
Silverdale, WA 98383
List Price: $20 a year membership

CIRCLE 737 ON READER SERVICE CARD

Pascal for the IBM PC
Kevin W. Bowyer and Sherryl J. Tomboulian
Brady Communications, Inc.
Bowie, MD 20715
(301) 262-6300
Copyright: 1983
Cover Price: $17.95
ISBN 0-89303-280-8

CIRCLE 736 ON READER SERVICE CARD

Turbo Pascal, more than 100,000 copies of which have been sold to date, has developed an aftermarket. Borland International itself started it off a few months ago with the *Turbo Toolbox*, a collection of sorting and searching routines based on Quicksort and binary trees, perhaps the fastest methods of sort and search yet devised for small computers. (They're the same methods *dBASE II* uses to keep its files in order and process queries.) The *Toolbox* routines are written in Turbo Pascal and sold in source code form, so you can use them and understand how they work. Borland's Phillipe Kahn says of the *Toolbox*, "If people can't make *dBASE II* do what they need it to do, now they can write their own database."

Turbo Pascal's graphics abilities are not as stellar as those of IBM Advanced BASIC. But Metagraphics, Inc., of Mountain View, California, modified its $150 *MetaWindow* graphics library for use with Turbo Pascal. *MetaWindow* offers viewports, pull-down windows, fill patterns, polygon draw, graphics GET and PUT, proportionally spaced text fonts, full-color control, and mouse interface, as a collection of machine code subroutines. The package supports the IBM graphics adapter as well as Hercules, Tecmar, AST, CCS, and STB. Since Turbo Pascal cannot link with library routines, a modified Turbo version of *MetaWindow* loads above PC-DOS and can be called through a vector in low memory. It is the only way I know of to do advanced graphics from Turbo Pascal. It lacks only ELLIPSE and DRAW of BASICA's graphics power. My testing has found it fast and reliable.

Systems Management Associates of Raleigh, North Carolina, has released a PC DocuMate keyboard template for Turbo Pascal. It lists and briefly describes all of Turbo's built-in procedures and functions, along with compiler directives, reserved words, color tables, operators, and standard devices. The worst part of learning any language is thumbing through the manual to determine how many parameters (and in what order) to give a procedure. SMA's $14.95 Turbo Pascal DocuMate eliminates that annoyance.

Turbo Pascal has a user group, called TUG, that publishes a bimonthly typeset newsletter, *TUG Lines*, edited by John Craig. *TUG Lines*, usually 25 pages long, includes letters asking for help, software contributions, beginners' tutorials, and technical advice. Its contributors are the more than 2,500 avid Turbo Pascal users. TUG membership costs $20 a year, which includes six issues of *TUG Lines*.

Brady Communications, Inc., in Bowie, Maryland, is publishing a second edition of *Pascal for the IBM PC* by Kevin W. Bowyer and Sherryl J. Tomboulian that will include specific information on Turbo Pascal. It's scheduled to appear early in 1985. —J.D.

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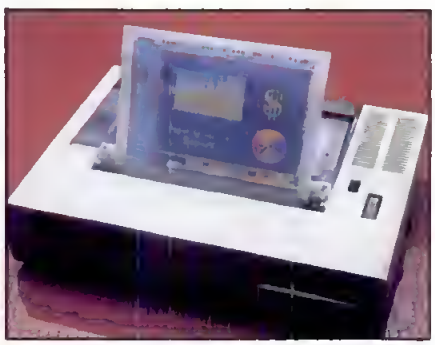

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source file. Execution of code in blocks runs from top to bottom. GOTO branching, while allowed, is discouraged. Pascal programs have a clean, readable flavor, which BASIC approaches only when in the most skilled hands.

Pascal has a small but powerful repertoire of instruction statements. IF/THEN/ELSE, WHILE/DO, REPEAT/UNTIL, CASE/OF, and FOR/DO, for example, control program flow; READ/READLN and WRITE/WRITELN send output to your screen, printer, or disk files. These statements operate on simple data types and structures built from those data types: characters, integers, real numbers, Booleans, arrays, sets, and various combinations thereof, grouped into records.

The Pascal language definition is "lean and mean." Simpler than BASIC and more organized, it resembles the *dBASE II* command language in some respects. People who are fluent in *dBASE II* should have no trouble learning Pascal. BASIC is a portmanteau language, into which everything but the kitchen sink has been thrown willy-nilly, with little thought as to how the whole thing fits together. You can use BASIC for years without ever using *all* of it, but Pascal naturally draws you into contact with the entire language definition. BASIC is amorphous; Pascal is crystalline.

Not Exactly Pascal

Turbo is, in fact, both more and less than Pascal. A handful of features in the Pascal language definition are not present in Turbo Pascal. Turbo lacks disk file GET and PUT. In the interest of keeping Turbo Pascal small and fast, the function of GET and PUT is carried by READ and WRITE instead. GET and PUT are virtually always the slowest form of file I/O available in a Pascal compiler, and so this feature is a problem only when you are attempting to compile code written for another compiler under Turbo Pascal.

It also lacks procedural parameters. I regret that Turbo Pascal cannot pass functions or procedures as parameters.

Also, Turbo's GOTO statements cannot leave the current block. In other words, you cannot jump from inside a procedure to inside another procedure, or to inside the main program. All in all, this is a good thing. GOTOs have their uses, but jumping from block to block is not one of them.

That's all Turbo doesn't offer. Everything else possible with the Pascal language definition is possible in Turbo.

Of all IBM PC compilers, Turbo Pascal has the best repertoire of tools for accessing PC-DOS.

Extensions of Pascal

Many of Turbo's features extend Pascal. All its extensions point toward the creation of useful, reasonably portable applications packages. One of its major extensions is its dynamic strings. Turbo closes Pascal's biggest hole the same way UCSD Pascal and Pascal/MT+ do, by supplying strings whose length can vary according to what you load into them. Turbo also includes a set of string-handling procedures identical to those of Pascal/MT+: LENGTH, COPY, POS, CONCAT, INSERT, and DELETE. In addition, Turbo has an STR function to convert a numeric value into its string equivalent, and VAL to extract a numeric value from a string variable. To my knowledge, no other Pascal includes VAL and STR.

Terminal control is another of Turbo's major extensions. It includes a set of terminal control procedures for screen formatting: CLRSCR clears the screen; CLREOL clears from the cursor to the end of line; GOTOXY (*X, Y*) positions the cursor to *X, Y*; DELLINE deletes the line containing the cursor; and INSLINE inserts a line at the cursor position. It moves down the old cursor line and the lines below it. No other PC-DOS Pascal includes any kind of terminal control. A hidden advantage here is that Turbo Pascal has been implemented on a great many microcomputers in addition to the IBM PC. You can compile a carefully written program using Turbo's standard screen controls and run it identically on dozens of diverse machines. I have compiled and run a simple full-screen file editor without changes on the IBM PC, the Xerox 820, the Victor 9000, and the Zenith Z100. You really can't get a whole lot more diverse than that. DP managers who must support in-house software for a number of incompatible microcomputers might find Turbo Pascal the key to devising "one source fits all" programs.

Turbo also offers random file I/O and block file I/O. Random file I/O is the ability to read or write any record in a file without scanning through the entire file from the beginning. Turbo has a SEEK procedure identical to that of UCSD Pascal. Turbo also allows high-speed access to files in blocks of 128 bytes, using BLOCKREAD and BLOCKWRITE procedures similar to those of Pascal/MT+ and UCSD Pascal.

Another extension of Turbo involves its graphics and sounds. Turbo Pascal for the IBM PC allows some graphics and sound control (available only on this version). The graphics statements allow you to plot points and draw lines. You have full control of color in both text and graphics modes. This version includes a primitive windowing function, which defines a rectangular area; it sends drawing that you do only within the window to the screen. Turbo graphics do *not* include such BASICA graphics statements as CIRCLE, graphics GET and PUT, VIEWPORT, DRAW, and PAINT. The only serious omission here is that of the graphics GET and PUT, without which serious graphics work is impossible. (I felt the loss so keenly that I hired a college student to write GET and PUT for me in assembly language.) A SOUND statement produces a

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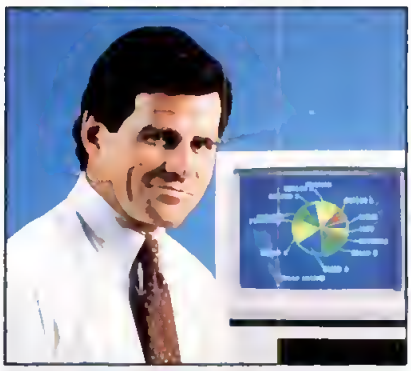

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CIRCLE 102 ON READER SERVICE CARD

tone of a specified frequency for a specified time. Nothing like PLAY is implemented.

Turbo's low-level machine hooks comprise another of its major extensions. Of all IBM PC Pascal compilers, Turbo Pascal has the best repertoire of tools for accessing PC-DOS, the IBM ROM BIOS, machine memory, I/O ports, and other hardware resources. One simple procedure, for example, allows you to make any software interrupt and pass all 8088 registers and flags to the interrupt code. Using this procedure, I was able to trigger screen prints, interface to the Microsoft Mouse, and communicate through the COM1: serial port, all within the same evening of experimentation. All machine memory is available through the elegant provision of the predeclared MEM array. To "poke" a value to a location in memory, you need only write:

```
MEM [SEGMENT : OFFSET] :=
  BYTE_VALUE;
```

You may also position "absolute" variables anywhere in memory. I have used this feature to manipulate graphics screens as though they were simple arrays of bytes. All in all, Turbo Pascal makes it possible to do virtually anything the PC can do without resorting to assembly language.

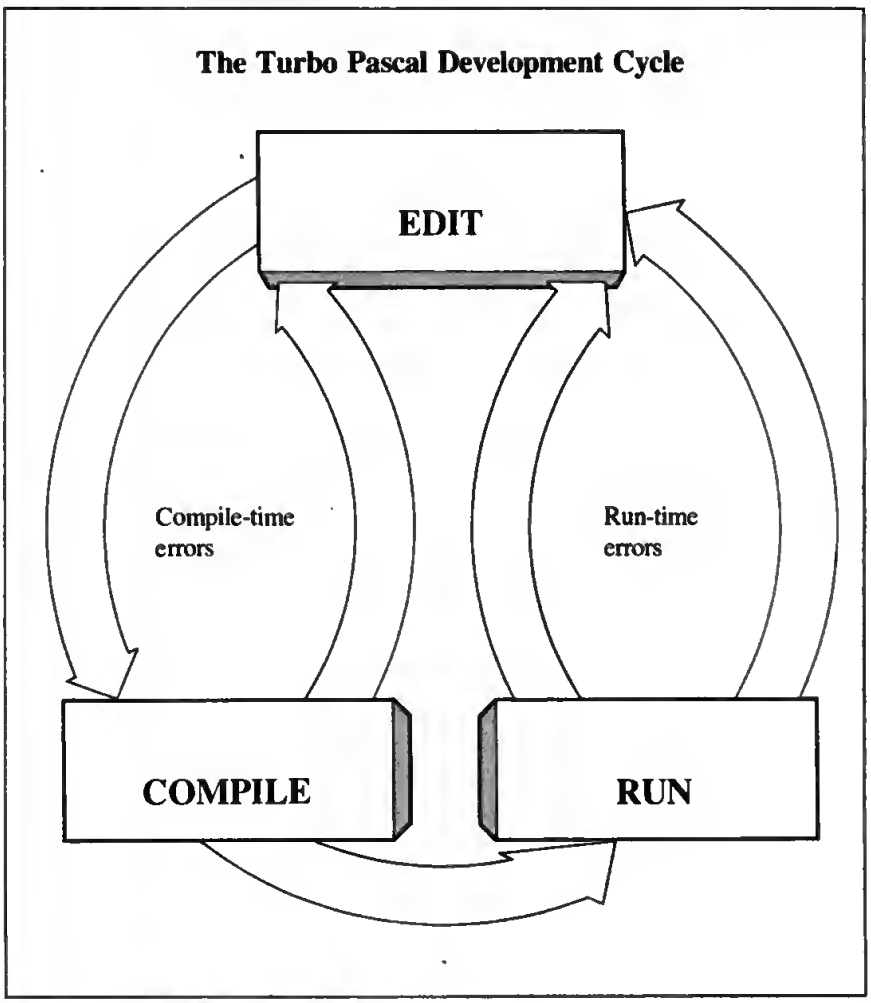
Turbo also offers 8087 support. It handles real numbers fast, much faster than Pascal/MT+, and nearly as fast as Microsoft's MS Pascal. But if you want to write programs with real-number support that really zings, use Turbo87 Pascal, a separate version of Turbo Pascal. It has all the features found in the $49.95 version, plus full 8087 support. At $89.95, it costs more, but if you need fast-floating point processing (especially on such transcendental functions as logs, square roots, trig functions, and the like), you'll find it worth the premium. A program can run from 10 to 300 times more quickly if 8087 support is included. Since you cannot buy the 8087 chip for less than about $175, getting 8087 support for less than $100 seems more than reasonable.

Overlays Made Easy

Turbo Pascal cannot create a program larger than 64K on disk. (This limitation is fundamental to PC-DOS .COM files, and Turbo Pascal produces only .COM files.) Now, 64K is a lot of program, but a large accounting system could be several times that size. Turbo Pascal allows you to cut an enormous program into pieces, to load automatically as needed. The pieces are called overlays since they overlay one another in the same region of memory. Your program is, in a sense, folded up, and a program comprising 256K of code can run handily in a 64K PC, or PC*jr*.

I have used Pascal overlays extensively for several years with Digital Research's Pascal/MT+. To put it mildly, using Turbo overlays is much easier. With Pascal/MT+ overlays, you must draw a map of your computer's memory system and decide at what absolute address overlays should run, and how far you must offset each overlay's static data into the static data segment. This system is ridiculous; computers, not programmers, should do hex arithmetic.

In contrast, Turbo Pascal merely requests that you tag a procedure or function definition as OVERLAY. The compiler does all the busywork—deciding where the overlay should go, how large it



The Turbo Pascal Development Cycle

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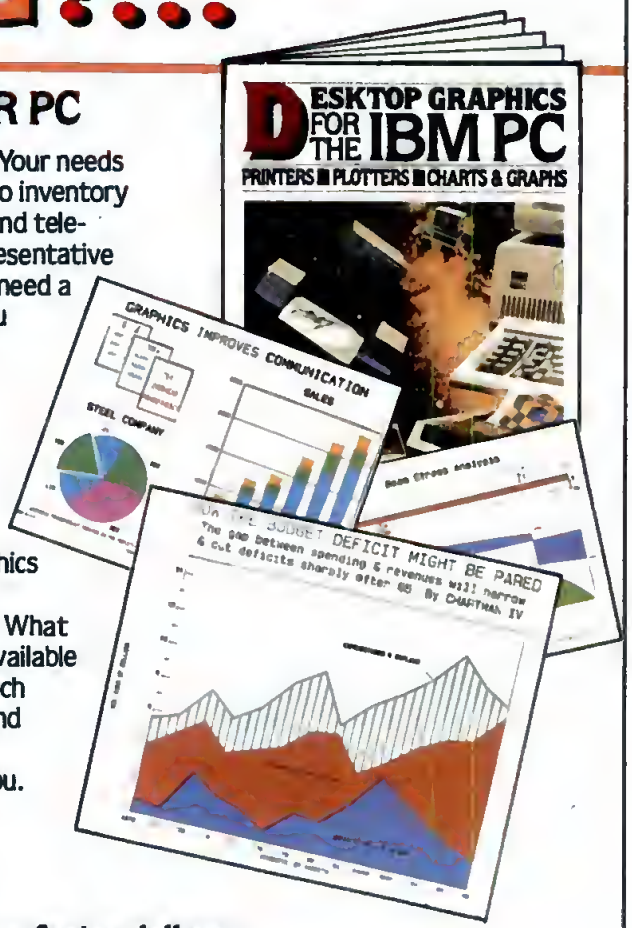

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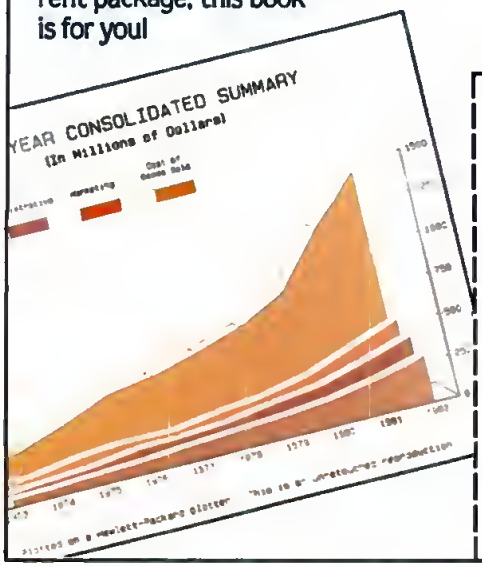

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must be, and where to store its static data. You can create up to 255 different overlay files and allocate up to 16 different overlay areas ("holes" in a program into which you can load overlay files as needed) in your program.

Borland International has supplied good documentation for the overlay feature. I took only 20 minutes to get a test program with six overlays to run. The overlay manager is quite intelligent; it checks to see if an overlay is already in memory before it loads it again from disk. The Turbo overlay system allows a single program to be arbitrarily large, limited only by your disk system and your own cleverness. All in all, the system is a great feature, adding to Turbo's usefulness and value.

Overlays also come in handy when you want to configure a program to deal with different computers, or different configurations of the same computer, without recompiling the code. For example, you could write a fast, direct-to-memory screen control overlay separately for the color/graphics adapter and the monochrome display adapter. An install program, learning that the PC in use has the color board, could delete the monochrome-specific overlay file and give the color/graphics overlay file the proper name that the master program would recognize. Once the first call is made to the screen controller and it is loaded from disk, all subsequent calls will go right to memory for the screen control routines. You could also use this same trick to allow PC software to be installed on screen-incompatible computers like the Z100 and Victor 9000.

Documentation

Turbo Pascal's documentation does not come in a slipcase. The reference manual is, in fact, a trade-size paperback book of about 300 pages. This binding probably kept costs down, but the spine cracks all too easily with heavy use. Worst of all, it will not lie flat on a table open to a specific page. New users will find themselves holding the book open awkwardly with one hand while striking keys clumsily with the other. My own solution was effective, if drastic: I cut the binding away completely with a Rockwell band saw, punched holes in and joined the freed pages, and tucked them into a slipcase that once held DOS 1.0 documentation.

The manual has been typeset; the small print is clear and precise. The writing quality, however, is not up to what you'll find in applications packages like Lotus's *1-2-3* or *WordStar*, but the manual may well set a new standard for clarity among language compilers. Its writers have slanted it toward the computer-literate layperson, not the computer jock. Jargon is restrained here as compared with that in the documentation for IBM/MS Pascal. A touch of humor and frequent accommodations for human foibles make this manual very approachable. For example, when explaining the editor, it reads,

> [The Ctrl-Q-L] command lets you restore changes made to a line as long as you have not left the line . . . . For this reason, the Delete Line command (Ctrl-Y) can only be regretted, not restored. Some days you'll find yourself continually falling asleep on the Ctrl-Y key, with vast consequences. A good long break usually helps.
> Amen.

The acid test of a Pascal reference manual is, will it teach a newcomer Pascal? My answer would have to be no. Although you could learn Pascal by writing toy programs and turning them loose to see what blows up, that's no way to develop a good programming style. I recommend that you use *Personal Pascal* by David E. Cortesi and George M. Cherry (ISBN 0-8359-5522-2, Reston Publishing, 1984) as a guide, with the Turbo manual handy to explain specific details. *Personal Pascal* does not mention Turbo specifically, but Turbo Pascal is very similar to Pascal/MT+. You can resolve the minor differences fairly easily.

> Turbo Pascal has never once crashed my PC in the 4 months that I have been using it intensively. This record is an enviable one.

Ease and Reliability

Turbo Pascal for the PC comes installed for the PC hardware; no installation operation is necessary. The menu screen spells out all commands in full, and yet you can invoke each by pressing a single key.

The Turbo text editor is a subset of *WordStar*, with some (irritating but not fatal) quirks. The editor does not use tab characters; if you import a text file with tab characters, they appear as highlighted *I*'s. This does not affect compilation, but it destroys readability. Turbo tabbing sends your cursor to rest under the first character of the next word in the line immediately above the current cursor line. If the line above has no text, pressing the Tab key does nothing. This quirk is very irritating, but after several months I have grown used to it.

I happen to love *WordStar*, but I know some of you detest it. Turbo Pascal's installation program allows you to redefine the keystrokes necessary to invoke a particular command. A college student who worked with me on Turbo blithely transformed the editor so that it looked like the Yale Editor in a matter of minutes. Turbo Version 1.0 had problems with keystroke redefinition, but evidently Borland has eliminated them in Version 2.0.

I found one bug in the PC implementation of Turbo Pascal; it is a rather arcane one, and the way I found to work around it

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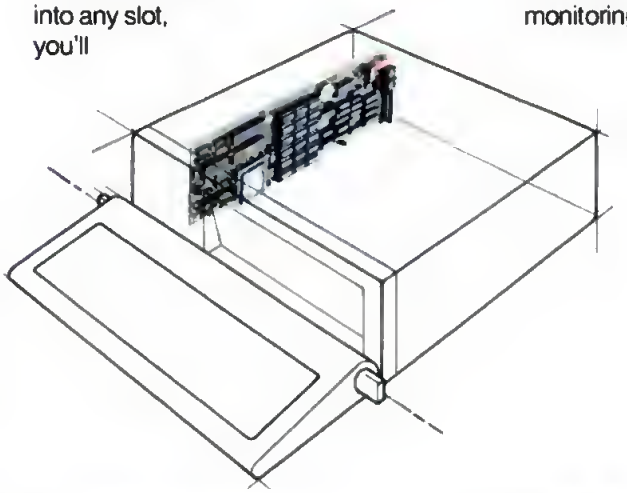

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may seem trivial, but it works. The SEG standard function will not accept a procedure or function identifier, although the manual maintains that it will. Fortunately, the CSEG function accomplishes the same thing very well. Borland is aware of this bug, and I assume that they will fix it soon, but in any case, my code will not suffer. (I also found a small number of bugs in the generic CP/M-80 version, but they do not seem to appear in the PC version. For that reason I will not go into them here.)

Just about every other language compiler I have ever used has sent my machine spinning into the Twilight Zone from time to time. Pascal/MT+86 does it occasionally, and MRI's Modula 2 crashes when I look at it cross-eyed. But Turbo Pascal has never once crashed my PC in the 4 months I have been using it intensively. Furthermore, the program code it generates handles run-time errors neatly, with a safe return either to DOS (for standalone program operation) or into the Turbo editor to explore the problem. This record is an enviable one. I had come to believe that some obscure physical law made language compilers cranky and prone to crashes. From now on I will be less forgiving.

Complaints

I do have some complaints about Turbo Pascal, but each time I recall the price, I tell myself I'm just being a curmudgeon. But you be the judge.

My first complaint is that the manual is unwieldy. It won't lie flat. I suggest that Borland redesign it using a plastic spiral binding. A new binding would not add greatly to the cost yet would continue to prohibit it from being fed through copy machines. Also, the Version 2.0 addendum should be merged with the main text. The two separate indexes make finding a given item much harder than it should be. Plus the manual needs more examples, especially of language features unique to Turbo Pascal.

Another complaint I have is that the PC Turbo compiler always inserts a screen clear ROM BIOS call at the beginning of each program file, whether you want it to or not. This quirk makes it impossible to run PC Turbo programs on machines that do not respond to IBM's INT 10 jump table. Thus I found it impossible to develop software on my PC to run on the Victor 9000 or the Z100. Not all programs should format the screen. This feature should be optional.

I also object to the fact that Turbo does not have a relocatable object format. In other words, you cannot link third-party subroutine libraries like Metagraphics's superb *MetaWindow* graphics library to code compiled under Turbo Pascal. (Late Note: Metagraphics has released a DOS-extension style version of *MetaWindow* that is compatible with Turbo; see the sidebar "After Turbo, the Deluge" for more information.) In my opinion a relocatable format option that is compatible with MS Link would be worth whatever extra it might cost.

> Turbo Pascal has the potential to be developed into the finest Pascal compiler ever implemented on any computer of any kind.

And, as a final complaint, I maintain that the text editor should handle tabs in the expected fashion, as described above.

When compared with what Turbo can already do, my objections are perhaps slight. I only hope that Borland International pays enough attention to user needs to develop Turbo into the product it has the potential to become: The finest Pascal compiler ever implemented.

All software products have a certain feel to them—a complicated vector sum of user interface, documentation tone and quality, product emphasis, speed, and reliability. A vendor can strongly affect a product's feel as well by slanting it toward a particular audience.

Microsoft's MS Pascal, for example, is a large, complicated, and awesomely powerful Pascal compiler, perhaps the most powerful compiler I have ever used. Microsoft has deliberately slanted it for the computer expert; its documentation is 100 percent jargon, virtually inaccessible to the beginner. Pascal/MT+ shares the same feel, as if to say, "Only the initiated need apply."

IBM BASIC, on the other hand, has a very different feel, one of "Try me. If you make a mistake, it's no big deal." Turbo Pascal shares that feel, from its uncomplicated structure to its reasonably accessible user guide.

Turbo is certainly the best Pascal for first-time Pascal users. Its immediate feedback and lack of time spent watching while the machine does its work makes it a natural for schools, whose students have limited attention spans. Its price, comparable to that of an expensive college textbook, makes it possible for each student to own a copy.

VolksPascal

I like to call Turbo Pascal a VolksPascal, a compiler for folks who don't have an M.S. in computer science. It's not as powerful as MS Pascal, but it's simpler. In its simplicity it achieves an elegance that no other language compiler has ever displayed. And although Turbo Pascal is not as powerful as MS Pascal, it's not *much* less powerful. The addition of overlays to Version 2.0 makes Turbo Pascal a near-perfect applications language.

If you simply must have the greater power of MS Pascal, you know who you are. Everybody else, give Turbo a try. Your $50 will easily give you more for your money than any other $50 you have ever spent. ■

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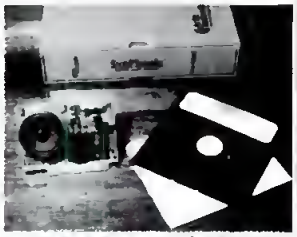

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Filebase is a super utility that turns a static correspondence file into a correspondence database. You won't want to use MailMerge without the file-juggling muscle of Filebase.

Filebase Rescues Stodgy MailMerge

The *MailMerge* database is the stodgiest database in computerdom. Although it's supposed to be a correspondence file, you can't do much more than individualize letters with it. Instead of pulling selected records out of a file when you need them, *MailMerge* files just sit there until an outside program comes along to do the basic filing chores.

A correspondence file shouldn't be so static. If, for instance, you wanted to turn your address file into a handy, hard-copy reference printout, you'd naturally want the proposed list to be sorted alphabetically by last name. And what if you need to cull a mailing list from a huge address file, and the people on your list must meet special criteria? You would save time if you could write a subset of the appropriate names and addresses to a temporary work file.

But to manipulate *MailMerge* files for these purposes, you first have to store the data with a high-level database manager. Then, when it's time to print letters, you have to use a built-in program function to write records in the *MailMerge* comma-delimited format. For speed and efficiency, this procedure leaves a lot to be desired. What you need is a program that makes juggling *MailMerge* files a quick-and-dirty office routine.

MailMerge Super Utility

Filebase, a database manager from EWDP Software, Inc., in Indianapolis, may be just the *MailMerge* super utility you've been waiting for. It stores data in the comma-delimited format and gives you a range of file management options to apply to existing *MailMerge* datafiles. You can choose any of the following from the main menu:

- Sort a file or sort and merge two files into one new file
- Select records from one or two files into a new file
- Sort and select records simultaneously
- Print labels, envelopes, and other listings on the screen or printer
- Add new fields to records from an existing file and output the expanded records to a new file
- Create a new file and enter data
- Key in new records to an existing file
- Move fields that are located in one file

Illustration: Rich Del Rosso

into a new file
- Update a fixed-length records file or search by key
- Convert a file to fixed-length records to use the Update option
- Change data disks in any drive.

Filebase covers all the basics. It features a data input screen with user-defined field prompts, print-time formatting of envelopes, labels, lists, and text fields, and on-screen or hard-copy column listings of fields.

You'll notice that *Filebase* lacks some features of high-end programs: sophisticated report formatting, access to more than two files at a time, and complex calculations. If you need those functions, *Filebase* isn't for you. But when manipulating *MailMerge* files, you probably won't miss them.

> Instead of pulling selected records out of a file when you need them, MailMerge files just sit there until an outside program comes along to do the basic filing chores.

Options with Muscle

Filebase flexes its muscle when pulling selected records out of a file. In addition to the field comparators you'd expect—greater than, less than, equal to, between two values—you get some nifty options: "Select or exclude by matching field con-

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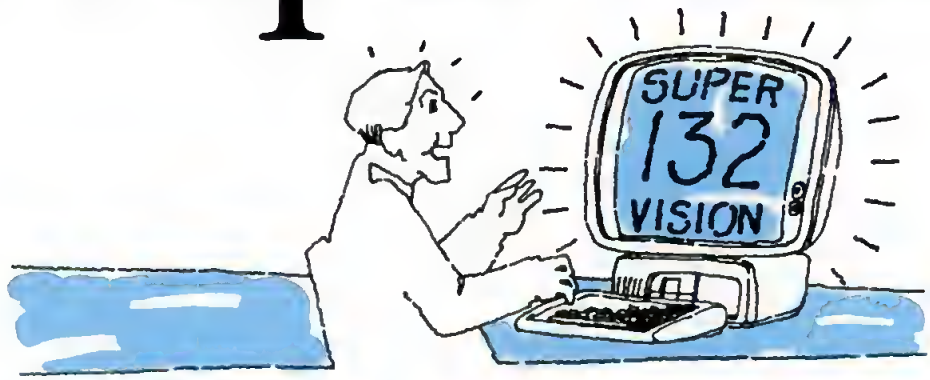

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tent against a list of up to 300 unrelated items," and "Select or exclude up to 1,000 records by listing their sequential number in the file." *Filebase* also lets you scroll through the database, tagging records interactively—a useful feature when inviting a random list of guests to a reception, for example. In addition, *Filebase* includes the option to "Select/exclude by searching fields for *all* or *any* of up to five field substrings, with wildcard characters allowed." This substring option is handy if, for example, you need to find names followed by M.D. or Ph.D.

A nice touch: *Filebase* can sort on embedded ZIP codes, last names, and dates in the MM/DD/YY format. And *Filebase* has a valuable safety feature. It never changes an input file; program output always goes to a new file, which you may send to a blank disk in the A: drive.

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base and *MailMerge* share the same comma-delimited format for storing data that BASIC uses. If you can program in BASIC, you are equipped to add to your options. You could write short routines to open files and perform special calculations or send customized reports to disk, screen, or printer.

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Data Entry

To store records, you first give *Filebase* a set of field prompts—name, address, and so on—then fill in the prompted blanks that are displayed on-screen. As *Filebase* saves each record, it puts formatting commas and quotes in the right places. An old hand at *MailMerge* could create files manually with *WordStar*, the drawback being that formatting errors cause downtime during a print run. Luckily, *Filebase* has a data file debugger. You simply list the contents of a field on-screen. *Filebase* will show you where you committed a formatting error; names become street addresses, for example:

Unlike other programs, Filebase does not use a disk-based index that must be updated for each new record.

```
1 Jack Smith
2 Linda Jones
3 Jim Berwell
4 1155 Gershwin #B3
5 4300 Wilshire—Suite 1005
```

To correct your error, you'd simply make a note of the number of the last unaffected record and then use *WordStar* to find the corresponding file line. For operations that have a heavy output of letters, the debugger alone is worth *Filebase*'s price.

Filebase saves records with remarkable, RAMdisklike speed. There are two design features that account for its rapid record-saving: first, it holds new records in RAM and writes them to disk in groups; second, unlike other programs, *Filebase* does not use a disk-based index that must be updated for each new record.

Because its files don't require indexing files and its records are not fixed-length,

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Records can be up to 4,096 bytes long, with 40 fields of up to 255 bytes. For electronic mail applications, a built-in function can convert records to the carriage return/line feed "block format."

MailMerge datafiles can be murder to read, especially when they include many fields. But scanning is easy with *Filebase*. The desired fields appear conveniently on-screen in columns. If you sorted the file beforehand, duplicate records stand out clearly.

You can send fields to the printer in columns, too. This option encourages you to create useful lists of such items as names, phone numbers, and purchase codes. The quickness with which *Filebase* gives you lists, sorts, and selected records might tempt users of "big" programs to write subsets of their data and then use the less complex *Filebase* to manipulate them. (*R:BASE SERIES 4000, dBASE II*, and others have built-in commands to write data in the comma-delimited format.)

Since it's usually a good idea to sort *MailMerge* files by last name for reference and by ZIP code for mailings, *Filebase*'s sort function is a very convenient housekeeping utility.

Print Features

When you're ready to print, *Filebase* word-wraps text fields to the width you've specified. This feature might be useful when sending order-acknowledgment cards, for example. A .pa dot command in your print-control file would stop the printer after the address. You could then manually remove the card, turn it over, and reinsert it to print the message. If you had selected the option to stop the printer between records, *Filebase* would let you key in a "remarks" field at print time to appear at the end of the current record.

Another frustrating *MailMerge* drawback is that it prints envelopes so slowly. When you hit P, there's an annoying pause while the program accesses data from the disk. But *Filebase* comes to your aid here too: it responds to the P prompt instantaneously. And because you request filenames and formatting parameters before you print, you don't waste your energy creating and debugging *MailMerge* print-control files. *Filebase* also prints fanfold labels faster than *MailMerge*.

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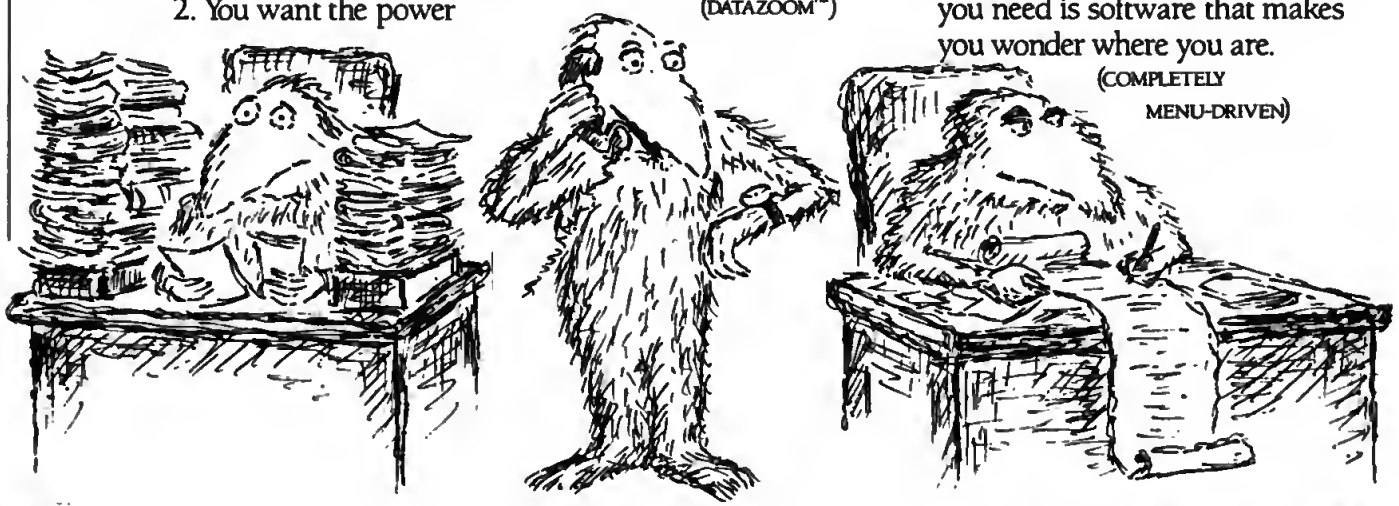

Juggling Files

Have you ever tried adding a data field to an existing *MailMerge* file? You probably found that pressing your little finger on the Ctrl key again and again, looking for the ends of ragged-right data lines, can be very tiring. *Filebase*, however, gives you a break. It creates new, empty data fields and lets you fill them in. You search by random-access key field or by scrolling forward through the file. *Filebase* can also move existing data fields around within a file, saving you time and effort. Lumping infrequently used fields at the ends of records will accelerate your data entry. And you can dump an obsolete data field from a file with the same function.

Adding a coded field opens up some interesting possibilities for the select-records option. Say you've assigned five client codes: ab, cd, ef, gh, ij. You could enter them in the same data field, separated by hyphens—ab-ef-ij, for example. You could then use substring matching to select records containing any or all of up to five codes.

When updating comma-delimited files with *WordStar*, even the sharpest-eyed users find that they go cross-eyed very quickly. *Filebase*'s random-search option takes the eyestrain and headache out of updating. First you use the option that converts your files to fixed-length records; then you do updates on the easy-to-read input screen. When you've finished, you can reconvert the file to variable-length records to conserve disk space.

Filebase includes demonstration disk files and a 70-page indexed reference/tutorial. Since I've been using *WordStar* and *MailMerge* extensively for more than 2 years, I'm not an appropriate judge of *Filebase* as a program for beginners. But I can say that in applying all program functions to five databases of 350 to 850 names, I found that none of my questions required more than an occasional glance at the manual.

Filebase isn't perfect though. It won't let you give your reports elaborate formats. And you won't have access to more than two files at a time. In addition, *Filebase* won't do sophisticated number-crunching.

But if you use *MailMerge*, you're sure to find that *Filebase* has a special place in your office. While high-end programs ostentatiously show off their data-crunching prowess, *Filebase* quietly flexes its muscles. It's a speedy Mighty Mouse featuring practical tools. Once you've tried *Filebase*, you'll wonder how you ever got along without it. ■

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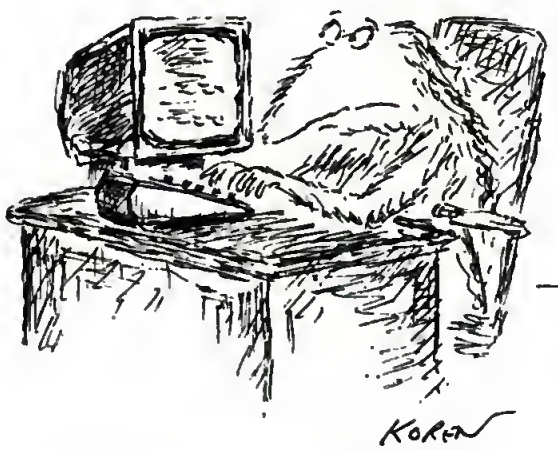

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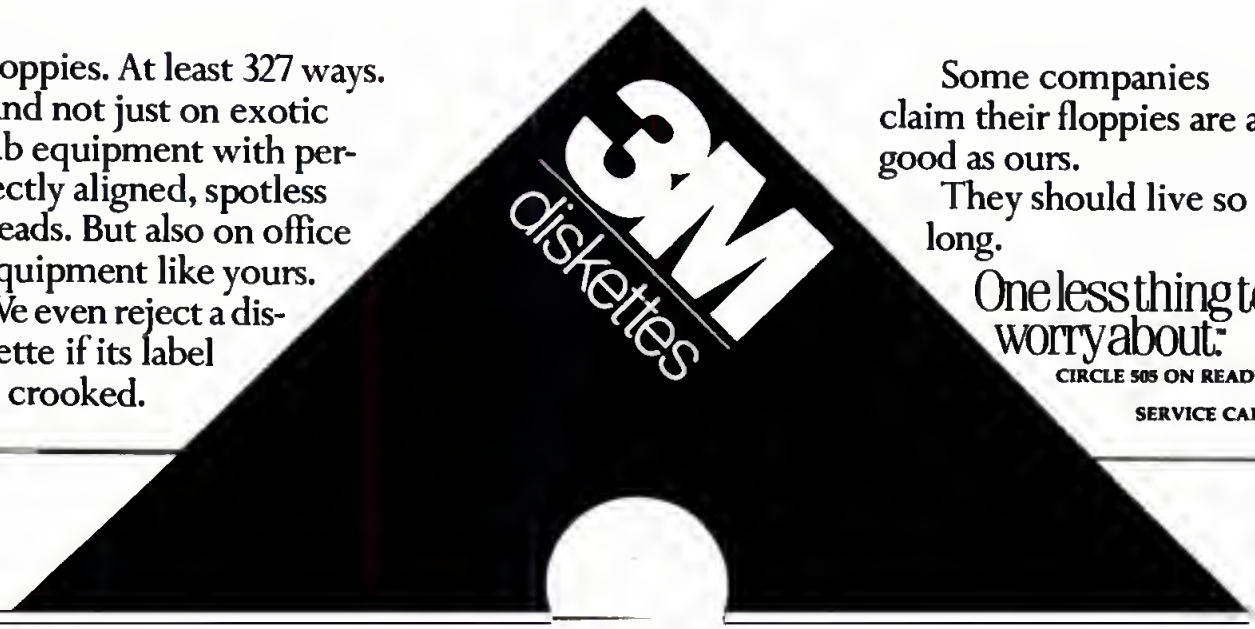

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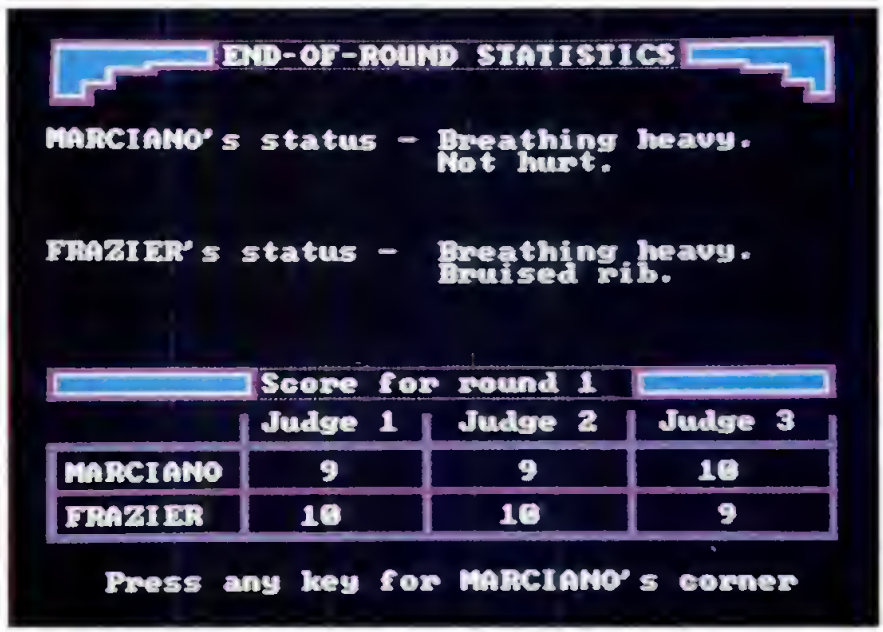
All through the ages, men and women have been tormented by conflicting feelings of attraction to and revulsion for professional pugilism. Protest though we may at the thought of paying to watch two humans attempt to bludgeon each other into submission, fighting has a peculiar appeal even to the most effete, lily-livered liberal. And a glance at the audience of a prize fight or a professional wrestling match reveals no shortage of women, either.

"But, it's wrong!" as Richard Nixon once said. As we move along in this modern age, 2,000 years from the days of the gladiators, there must be something that can replace the blood lust that is at the core of boxing's attraction.

Yes, folks, you guessed it: computerized boxing! No more sweaty arenas. Away with blood-spattered rings. So long, Howard Cosell (been waiting for years to say that). Bring on Sierra On-line's *Championship Boxing*.



In a *Championship Boxing* rematch, the judges put Frazier slightly ahead of Marciano after the first round.

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List Price: $34.95
Requires: 128K RAM, color/graphics adapter.

CIRCLE 783 ON READER SERVICE CARD

All seriousness aside, this is truly one of those breakthrough games that comes along only ever so infrequently these days. On a single sliver of silicon resides an erudite simulation of the abilities, styles, and records of boxers from the past 100 years as well as an entertaining participatory game with staying power. *Championship Boxing* is one of the games you'll want to trot out to show to your friends and neighbors when they ask you to demonstrate exactly what it is that your computer can do.

Or, suppose you find yourself engaged in a lively discussion among gentlemen down at the Cross Keys Tavern one Friday night and that blowhard lawyer from the insurance company stands on a table and declaims to the world that Rocky Marciano was the greatest fighter of them all and that anyone who thinks oth-

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SEE PAGE 26
CIRCLE 216 ON READER SERVICE CARD

erwise is a liar and deserving of a back-alley lesson in fistic arts. Don't roll up your sleeves—just plug in your PC. (You do carry your computer with you at all times, don't you?)

A Parade of Champs

There on the *Championship Boxing* disk reside the magnetic reincarnations of 53 of boxing's greatest. Of course, there's Marciano, champ from 1952 to 1956 and winner of 43 of his 49 fights by knockout. (He retired without ever losing a professional fight.) But also represented are John L. Sullivan (who won the title in 1885), "Gentleman Jim" Corbett (who took it away from him in 1892), Jim Jeffries (1899), Jack Johnson (1908), and Jack Dempsey, the "Manassa Mauler" (1919–1926).

You can also choose among Gene Tunney, Max Schmeling, Jack Sharkey, Primo Carnera, Max Baer, Joe Louis, and other greats of the twenties and thirties. More modern boxers include Floyd Patterson, Ingemar Johansson, Sonny Liston, Muhammad Ali, "Smokin' " Joe Frazier, Ken Norton, Larry Holmes, and Gerry Cooney. And if you follow divisions other than the heavyweight, there are a few of the best lighter fighters, including Roberto Duran, "Sugar Ray" Leonard, and current favorites Ray "Boom Boom" Mancini and Hector "Macho" Camacho.

The package comes with a set of well-done instructions, a booklet about the theory of boxing, and a history of the sport including biographies of most of the boxers. The program requires 128K RAM and will run on a PC with color/graphics adapter or a PC*jr* enhanced model. The graphics are designed for a color monitor but can be viewed on a monochrome monitor attached to the graphics board output.

Historically Correct

When you start out *Championship Boxing*, you're rewarded with a nicely drawn scene of a boxing ring. There, prancing to the tune of the old Gillette razor theme, is a scantily clad young woman carrying the title card back and forth. ("If not violence, then sex," I hear someone out there say. Wrong again: think of it as historically accurate scene setting.) *(continued)*

This shot of the second-round action shows the two heavyweights slugging it out.

You proceed, via an on-screen menu, to the selection of your boxers. You can select from one of the 53 fighters supplied, or you can choose to create your own pugilist—you select a name, age, height, weight, reach, endurance, style, and 15 other factors. Go ahead—put your mother-in-law up against Muhammad Ali for a laugh. The game also includes a pair of ringers: Matilda the boxing kangaroo and a wimp named Peewee. (Watch out for Matilda's feet, by the way.)

Strategy and Arcade Modes

Once the fighters are selected, you have a choice of two modes: Strategy, in which you give advice to your fighter between rounds but do not control the actual punches for him, or Arcade, in which the fight is controlled from the keyboard. You can tell your fighter to step back, move forward, jab, throw an uppercut, punch to the body or head, or cover up. In a two-player game, the boxer on the left is controlled by the function keys, the boxer on the right by the cursor keys.

Then two boxers appear on the screen. The program adjusts their skin color for historical accuracy, sizes them according to weight and height, and lets them loose to perform according to their abilities, records, and your fleet fingers on the keyboard.

If you choose to take the role of manager rather than boxer, you can limit your involvement to setting strategy between rounds and shouting instructions from the corner during the match. I found I preferred this game to the arcade version. It also allowed me to watch more closely the computer's realization of the differences in boxing styles. (For example, the young Muhammad Ali floats like a butterfly and stings like a bee; bull-like Marciano just wades in and punches.)

In This Corner

And so, sports fans, I put Marciano up against another hard puncher of more recent vintage, Joe Frazier. I managed both

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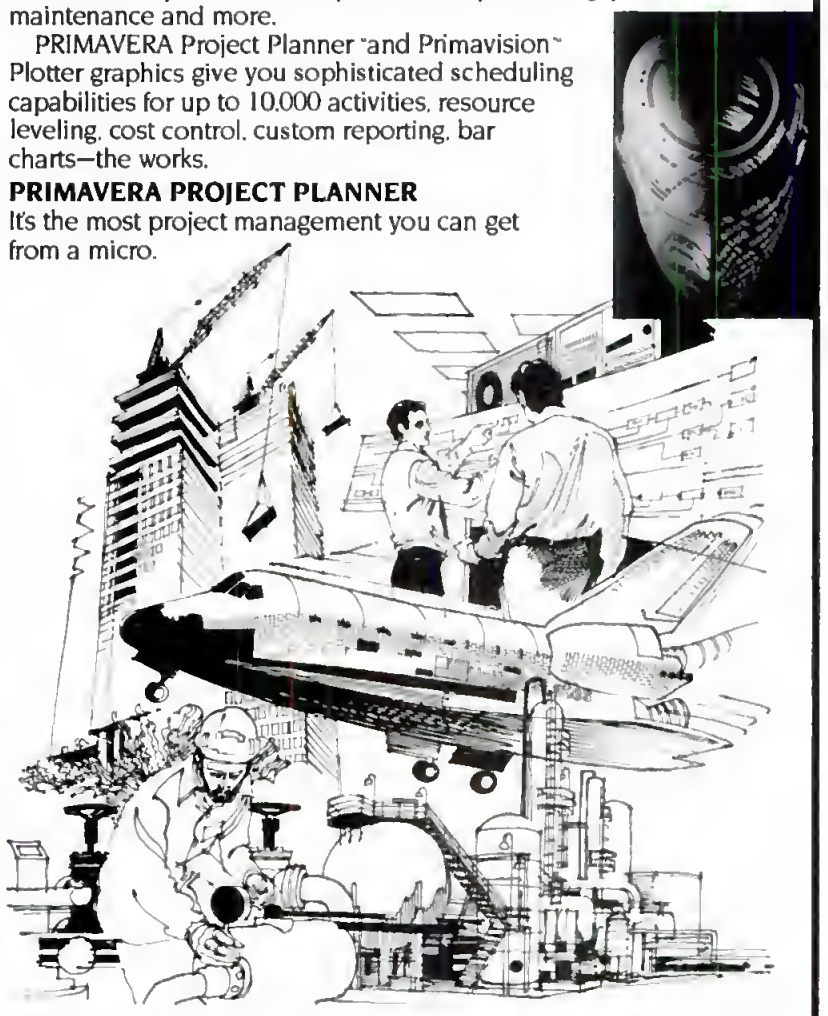

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CIRCLE 522 ON READER SERVICE CARD

fighters. Here was the "Tale of the Tape" the computer provided before the start of the match:

FRAZIER		MARCIANO	
Age	29	Age	32
Weight	205	Weight	184
Reach	74	Reach	68
Height	72	Height	71
Fights	29	Fights	49
Losses	0	Losses	0

The computer told me that it figured Frazier to be a 5 to 4 favorite in the 12-round fight.

I instructed both fighters to open the match by coming out slugging, and that's exactly the way the first round went. Marciano went right at Frazier, and they stood in the center of the ring exchanging punches. And then, midway through the round, Frazier dropped his jab and Marciano let loose an uppercut that knocked Smokin' Joe to the canvas where he sat out eight counts. But Frazier got up angry and 20 seconds later decked Marciano. The computer judges scored the round even.

The second and third rounds, during which both fighters were instructed to work on their opponent's body, went to Frazier as he repeatedly snapped Marciano's head back. Frazier was ahead on points as they entered the fourth round, but both fighters were clearly exhausted and just shuffled around the ring.

Managing Frazier at the start of the fifth round, I sensed the opportunity to end it all, and I instructed Joe to go for the knockout. Managing Marciano, I sensed that Frazier might be going for the knockout, and so I instructed Rocky to fight defensively—cover up and rest.

It was, alas, too late for the Rock. Forty-five seconds into the fifth round, Frazier lifted Marciano off the canvas with an uppercut, and Marciano was out for the count. In the background behind the on-screen ring, press photographers stood up to flash their cameras at the moment of victory, and someone tossed a hat in the air.

Championship Boxing, programmed by Dave Murry with graphics by brother Barry, is a knockout.

On *PC Magazine*'s scorecard, with a low of 0 and a high of 6, *Championship Boxing* is a heavyweight:

FUN:	5.0
CHALLENGE:	4.0
COLOR/GRAPHICS:	5.5
TOTAL:	14.5

■

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• MONITOR NEWS •

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By Hyres Vesion

The crowd is estatic as Quimax congratulates their Hi-Res champion PX-IV. One observer at the Olympiad Mr Misty Focus stated, "That PX-IV clearly demonstrated to the competition what a real winner is made of, superior pixel resolution like I've never seen before." Another observer Mr. Hunch Neckacker states "PX-IV displayed tremendous tilt and swivel action that looks fantastic from any position." Finally, Mr. Tex Writer shouts, "PX-IV showed his switching versatility between color and green text display, he really knows how to turn it off and turn it on."

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CIRCLE 326 ON READER SERVICE CARD

Kids and Computers: All in the Family

These four books take different approaches to teaching children about computers. Some expect parents to do all the work, while others leave the learning to the kids.

Microcomputers Can Be Kidstuff tries to gently introduce computers to young people. While the title certainly rings true, the book doesn't do much for the cause. The only "kidstuff" part of *Microcomputers Can Be Kidstuff* is some of the sentence structure, which strongly parallels the "See Jane run" genre of first-grade primers. Though the book contains a lot of valuable information, it is a work in search of an audience.

Where's Logo?

Microcomputers Can Be Kidstuff concentrates on programming techniques and languages, a lofty goal indeed. Author Anna Mae Burke presents a well-organized chapter on the fundamentals of problem solving that ends with respectable discussions of some difficult concepts like arrays, subroutines, and loops. Burke then proceeds to tackle BASIC and Pilot. These two languages are certainly important, but what's a kid's book without a mention of

Logo? Pilot is an interactive query language designed to write computer-assisted instruction (CAI) programs, but the examples the author uses are indicative of the worst aspects of CAI. The BASIC examples she chooses to captivate young novices include programs that calculate compounded interest and quadratic equations. With programs like these I'd stick to *Breakout* and leave the programming to adults!

Heavy on BASIC

Although *Growing Up with Computers* is ostensibly written to let you help your children learn to manipulate the computer, it is you who will be the computer whiz if you work your way through the authors' varied selections of BASIC programs. The programs are written in generic BASIC, so they tend to focus on simple, drill-type exercises. The sample programs include ones that measure your reading speed, teach vowels and consonants, synonyms and antonyms, math and reading skills, and some short but sweet party and action games.

The first third of this book tells the reader a bit about computers, how to buy them, and how the first day with the new toy should be, and it offers some guidelines for future software purchases. The remainder of the book is a BASIC tutorial with over 40 sample programs—you type in the programs, and your child uses them.

The book typifies the BASIC computer education dilemma. The programs the authors supply are terrific to teach *you* about programming, but they leave you and your children with a pretty dim view of the computer's potential to do anything useful or innovative. Because the authors want to keep the programs universal for all the different flavors of BASIC, they don't make much use of the features—like the PC's terrific graphics

PC FACT FILE

Microcomputers Can Be Kidstuff
Anna Mae Walsh Burke
Hayden Book Company, Inc.
10 Mulholland Dr.
Hasbrouck Heights, NJ 07604
(201) 393-6000
Copyright: 1983
Cover Price: $8.95
ISBN: 0-8104-5202-2

CIRCLE 794 ON READER SERVICE CARD

and sound—that endear the computer to children. While the authors are quick to mention the shortcomings of the infamous computer-aided instruction approach to learning, the sample programs are typical of CAI.

Despite its shortcomings, I like this book. My kids actually enjoy the CAI drills. (Kids love hitting buttons and being told they're right.) I actually learned about programming as I transcribed the programs in the book. (I've even enhanced some of them with my own sound, graphics, and twists on the theme.) The programs are all very short—a real plus for busy parents.

Off the Mark

I've been using Chilton's automotive book series for years. After reading *The First Family Computer Book*, I'm inclined to believe Chilton should stick to engines and stay away from family computers. Any book that includes *ABEND* (a mainframe term), *asynchronous* (a communications term), and *bagbiter* (plain old slang) as glossary terms is not intended for the family. The book presents a good deal of useful information, but it is typical of the traditional computer literacy book. The information is well presented and illustrated, but, despite its title, it never gets to the heart of what a family should do with a

Growing Up with Computers: A Parents' Survival Guide
Fredrick and Victoria Williams
William Morrow & Company, Inc.
105 Madison Ave.
New York, NY 10016
(212) 889-3050
Copyright: 1983
Cover Price: $7.95
ISBN: 0-688-02794-6

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K. Bruce Fingerle
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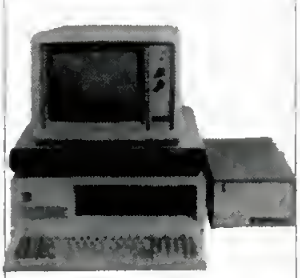

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home computer. There is too much technical detail about things like transient program areas, basic control modules, and RS-232 interfaces, and yet, when the authors discuss keyboards, they never differentiate between membrane keyboards and standard, typewriter-style keyboards, an issue much more pertinent to the family computerist. The discussion of software applications totally ignores the kids' market, and the book makes no mention of Logo in its discussion of computer programming languages.

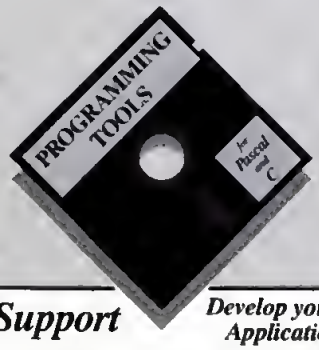
The Baldwins and Fingerle write well, and their book contains some excellent guidelines for making an intelligent computer purchase, getting set up at home, and finding a base for continuing support. Still, I would have to say that *The First Family Computer Book* is by no means the first, nor does it truly address the family.

Better Than a Babysitter

Finally, here's a book for parents who would rather leave the learning to the kids. *Kids' Computer Capers* is a fine example of what imaginative and creative educators can offer children. Your children will find themselves trapped inside a cold stone room in the pirate Red Beard's old house.

As the kids read on to discover how to escape from the house, they'll also discover how to write a BASIC program. Kids will learn what the binary code is, how chips are made, and other computer-related goodies. The pages are chock full of games, teasers, and minimysteries that reinforce important computer concepts, even as they provide plenty of entertainment.

So remember, when the going gets rough, the parent can give up and leave the reading to the kids. ■



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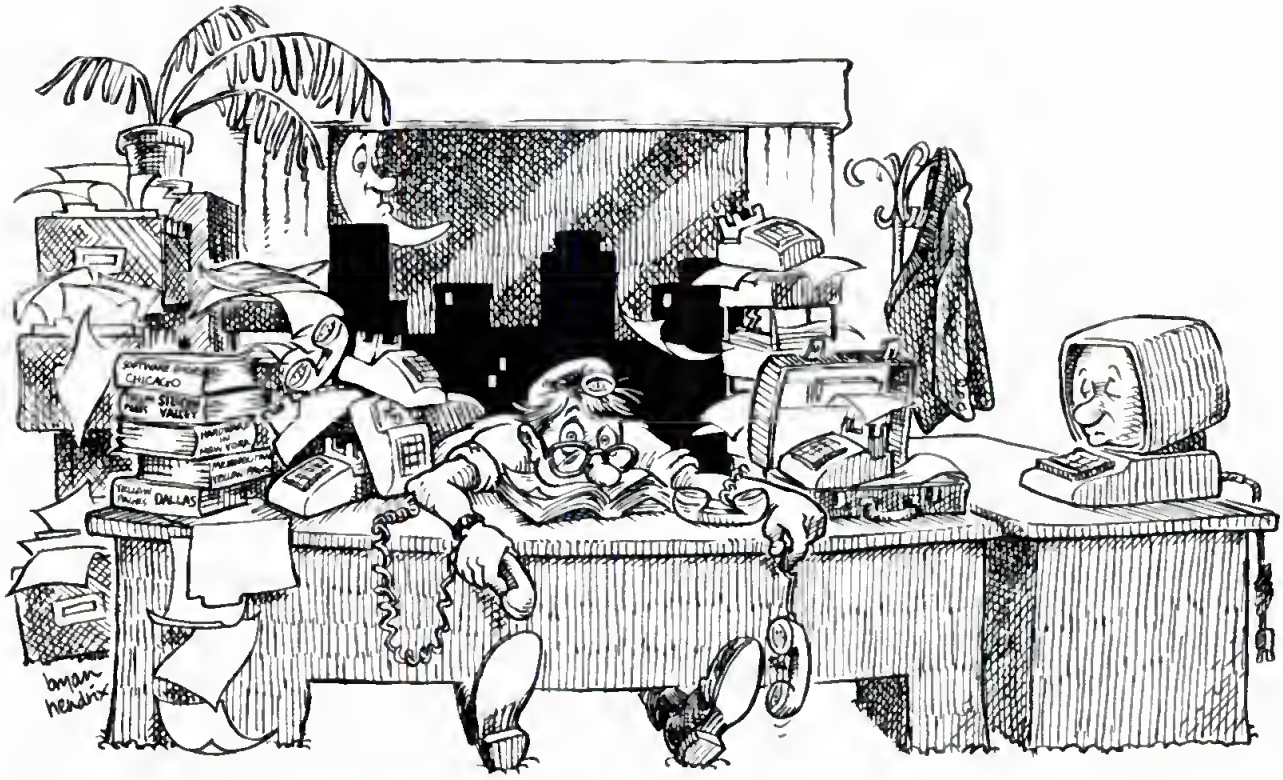

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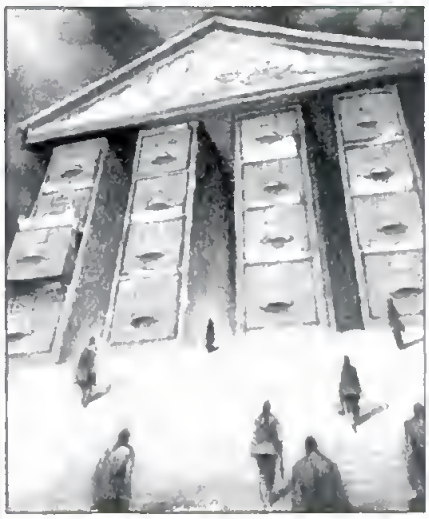
You turn to your computer, enter the word *Graham*, and within minutes you have a complete abstract of the document, together with its identifying number. Thirty seconds later, the document is in your hand. This instant retrieval capability is what computerized litigation support is all about.

It isn't unusual for a lawsuit to generate thousands of depositions, statements, and other pieces of paper. As you amass documents, you must organize them so they can be retrieved easily.

Manual Systems

For starters, you need to know the order in which the documents were written and who is mentioned in each one. You could maintain an extra set of the documents in chronological order in a separate file and then insert new documents into this group as you discover them.



The simplest manual way to keep track of all of the people involved in a lawsuit is to prepare an index card for each person and list the documents in which he or she is mentioned. Similarly, you could keep an index card for each subject and cross-reference these to document numbers and people. Even for such a relatively simple manual system, the amount of paperwork is immense. Also, the information that can fit on an index card is obviously limited.

Computerized litigation support systems are more accurate, far more flexible, and much faster than manual systems. Accuracy is perhaps the most important and obvious advantage. If the data is entered correctly, the computer cannot miss it when looking for a particular item. Computer systems are also more flexible. You can't always predict in what order or form you'll need information at a later date. If, for example, an individual you originally deemed unimportant suddenly becomes a focal point of the case, instead of going through all that paper again, you can simply have your computer search for references to that individual.

To set up a computerized litigation support system, you need not buy expensive software especially designed for this purpose. Almost any commercial database management program will work. It's important, however, to choose one that lets you create your own input forms. Figure 1 is an actual input form I developed for use with the database management program *DB Master*.

Important Fields

Let's take a look at the fields in Figure 1. These are the categories I have found most important, but you may want to include other information as well, such as references to trial exhibits, deposition exhibits, confidential memoranda, and custodians of originals.

Each piece of paper should have a separate identifying number. While it may

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```
                    DOCUMENT SUMMARY FORM

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(Co. producing doc, e.g.,            (Beginning & ending nos. of
CE, LMB)                             summarized documents)

DATE_/_/_                            TYPE_ _ _ _ _ _
(In YY/MM/DD format)                 (LTR, MEMO, etc.)

                                     VID (Y/N) __
                                     (Very Important Document)

NAME 1 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
NAME 2 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
NAME 3 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
NAME 4 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
NAME 5 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
(Names of authors, addressees, and people and companies mentioned
in text - last name, first initial)

CODE 1__ 2__ 3__ 4__ 5__ 6__
(Subject codes applicable)

TITLE _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
(Descriptive title of document)

SUMM 1_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
SUMM 2_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
SUMM 3_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
SUMM 4_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
SUMM 5_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
(Concise summary of important facts)
```

Figure 1: *Sample data entry form for a litigation support system.*

seem logical to assign a single number to a 10-page report, such a system ultimately leads to confusion when references are made to pages within a document or if a particular page is missing.

The Prefix field tells you the source of the document. For example, if IBM gave you a document, its prefix can be IBM. Samuel Langhorne Clemens's notes would begin with SLC-1.

Probably the single most important use of a computerized litigation support system is in arranging information chronologically and printing out a summary of that listing. The Date field in Figure 1 accepts dates in the YY/MM/DD format (a peculiarity of *DB Master*).

The Type and VID (very important document) fields, though not essential, can be powerful aids. In the Type field you would identify the type of document by entering, for example, INV for invoice or CON for contract. Later, you could use this field to locate all contracts signed by a particular person or all invoices sent to one customer.

The VID field can take a yes or no response, as it does in the Figure 1 example, but some attorneys prefer to enter a number from 0 to 9 to reflect the impor-

tance of a specific document.

The names of the authors and recipients and of people and companies mentioned in a document and their addresses are as important as the chronology. Prior to taking a witness's deposition, you can run a report that summarizes chronologically every document in which that person is mentioned.

Codes

Most cases can be broken down into a finite number of factual disputes or issues that can be assigned a number or letter code in the Code field. When you retrieve a document, many programs allow you to use look-up tables for the codes; then print the full text of the issue description instead of just the code letter.

The Title field below the Code field is useful if you decide that a certain printout does not require full summaries of all of the documents. This feature is handy for a quick reference listing of documents.

Although database systems on mainframes sometimes do full-text retrieval of every word in a document, most micro systems rely on some form of summary or abstract to distill the contents of the document. This abstract also helps in ensuring that the computer system is considered a part of the "work product" of the attorneys and not documentation discoverable by the other side.

Computerized litigation support is no longer the private domain of large firms and multibillion dollar clients. If you already have a PC, your only out-of-pocket expense is the software—and you may already have a database management program that you can use. With a PC and a powerful database program, even a solo practitioner can gain a significant edge over the competition. ■

Thorne D. Harris III is a New Orleans attorney involved in all aspects of computer law and the use of microcomputers. He is the author of The Legal Guide to Computer Software Protection *(Prentice-Hall).*

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Six Pak Plus Cards
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STB GraphixPlus — operates color & mono displays w/graphics & printer port $369
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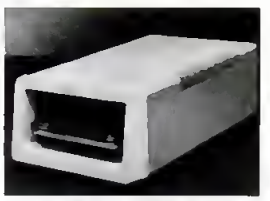

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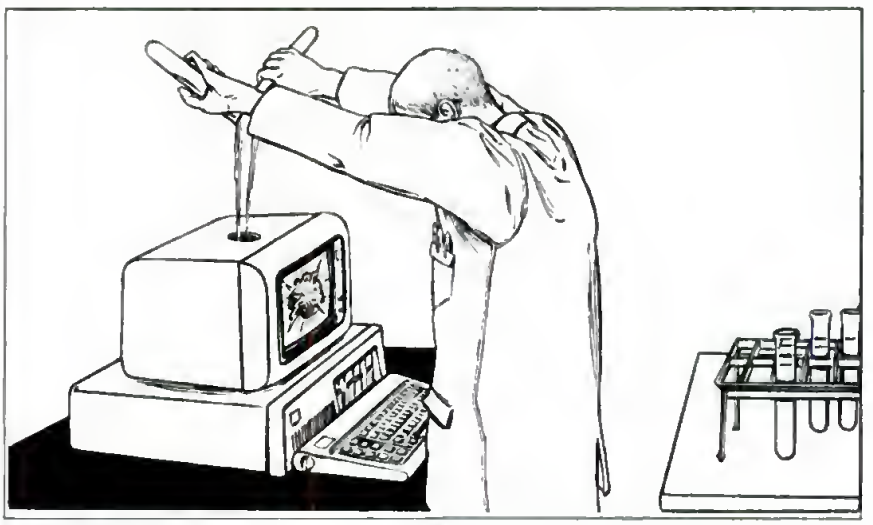
CIRCLE 106 ON READER SERVICE CARD

For Chemical Engineers: New PC Software

Chemical engineers are finally getting some good software of their own for the PC. These three new programs handle tedious problems and offer powerful design support.

Most engineering software for the PC is for electrical engineers—after all, they invented personal computers. But new software is expanding the usefulness of the PC for chemical engineers as well.

Chemical engineers design processes that change the properties of chemicals. They design in three steps: determining the physical properties of the chemicals, specifying the processes (called "unit operations"), and tying together the various unit operations into a factory. Most other engineers deal with static or steady-state conditions; chemical engineers deal with dynamic processes. By reducing dynamic processes to steady-state conditions in computer simulations, chemical engineers can make good use of the PC, especially at physical-property or unit-operation stages.



FlashCalc 1.00
Process Systems International
RD #3 Foxchase-Friendship Road
Vincentown, NJ 08088
(609) 268-0571
List Price: $700
Requires: 128K RAM, one double-density disk drive, an 80-column monitor, and a printer.

CIRCLE 785 ON READER SERVICE CARD

FlashCalc

FlashCalc 1.00 from Process Systems International determines equilibrium conditions when chemicals or mixtures of chemicals are heated or distilled. It performs nine calculations: bubble-point temperature and pressure, dew-point temperature and pressure, flash temperature and pressure, liquid fraction (for specified conditions), flash temperature (at a specified energy level), and flash curve from bubble to dew point. The last function, flash curve, can be calculated either as a condensation or a vaporization curve. In either case, however, the output is simply a listing of points along the curve in increments you define. Unfortunately, the curve is not plotted.

Process Systems International has gone out of its way to make the program usable quickly. Included is a library of 87 compounds that range from methane to acetylene derivatives with most common aromatic and monomer hydrocarbons in between. Each entry lists the necessary specific gravity, critical temperature and pressure, and other datapoints. You can also add your own entries to the library.

For a calculation of flash conditions, *FlashCalc* can handle up to 20 components mixed together. The calculations are carried out by standard engineering formulas: the Chao-Seeder method for computing equilibrium K values (as

Illustration: Kimberly Root

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modified by Greyson-Steed), the Redlich-Kwong formula for vapor-phase enthalpies, and the Yen-Woods method for liquid-phase enthalpies.

The program's main limitations are that it can only handle temperatures from 0 to 900 degrees F and pressures from 14.7 to 1,000 psi. Also, calculations greater than 600 psi or below 60 degrees F may be inaccurate (a limitation of the formulas rather than the program), and you need to know in advance about the potential existence of azeotropes. Finally, *FlashCalc* treats all water fractions as totally miscible in hydrocarbons, an acceptable assumption for small amounts of water but inaccurate for larger amounts. To the program's credit, it flashes warning messages when critical properties are exceeded.

Flow Network Analysis

When a typical chemical engineer gets a bunch of chemicals, the first thing he or she wants to do is shoot them through pipes into the processing equipment. Such pipe networks are the meat of *Flow Network Analysis (FNA)* from Kelix Software Systems. Starting with the assumption that the chemical of interest is a single-phase, incompressible fluid flowing in a circular pipe (a large assumption), the program allows you to compute the pressures and flows through a network of up to 90 nodes (pipe ends or pipe intersections) among 225 pipes.

PC

Flow Network Analysis
Kelix Software Systems
11814 Coursey Blvd., Suite 220
Baton Rouge, LA 70816
(504) 769-6785
List Price: $99 for one-time purchase of software and documentation; $199 includes telephone support and continual updates.
Requires: 128K RAM, BASICA, one double-density disk drive.

CIRCLE 786 ON READER SERVICE CARD

Like *FlashCalc*, *FNA* has no graphics capability, so the first thing you must do is make a pencil drawing of the network and label each pipe and node with a code number. You must also specify the physical properties of the fluid you are piping, the dimensions of the pipes, and the pressures at selected nodes.

The program then goes into a calculation mode using standard engineering formulas: the Church or Hazen-Williams formulas for calculating friction factors, the "multiple K" method for the effects of fittings and valves, and a set of nonlinear simultaneous equations for calculating network flows. You must then perform several iterations to work out all the nodal pressures and flows; *FNA* offers two methods of making the equations converge—the sequential or the simultaneous. You can switch between the two to get the fastest convergence.

HYSIM

FlashCalc and *FNA* are both good, if limited programs, but *HYSIM* from Hyprotech, priced at a cool $12,000, is a whole new ballgame. If your cash flow can't handle this, Hyprotech will lease *HYSIM* for $640 a month.

HYSIM is geared toward unit-operation design and perhaps can even handle small but complete chemical plants. It has programs like *FlashCalc* and *FNA* embedded in it. For instance, whereas *FlashCalc* can perform flash calculations on its library of 87 components, *HYSIM* can do the same on its library of 50 components (as in *FlashCalc*, you can specify your own additions to the library). But of course, *HYSIM* goes far beyond *FlashCalc*. It can perform heat and mass balance calculations around a long list of chemical-processing systems that includes heat exchangers, compressors, fractionators, reactor mass balances, distillation columns (under both short-cut and rigorous analyses), three-phase separators, coolers, heaters, valves, pipe manifolds, and recycle streams.

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CIRCLE 193 ON READER SERVICE CARD

might begin by specifying a processing stream—say, vacuum-distilled petroleum. The physical-property portions of the program would calculate the energy content, phase, and other properties of this stream. To distill it, you enter the command column, and the program shifts to this unit operation. In an interactive manner, you begin specifying the design of the distillation column. The program responds with workups of the properties of the stream being processed. You can specify as much as you want about the system, but if you enter contradictory data, the program asks for clarification. At the end of this process, you have the petroleum distilled to the conditions you want, with all the mass and energy flows specified.

HYSIM can instruct the PC to refrain from recalculating until all the changes have been specified and to isolate a particular part of a system, recalculate its parameters, and only then integrate it into the rest of the system.

HYSIM is only adequately documented; but most of the documentation consists of examples. Besides the documentation, Hyprotech sends you monthly update newsletters (and apparently the entire program is steadily updated with new enhancements) and has set up an 800 number you can call. Also, the company claims that a perplexed user can get an on-the-spot consultation via a modem linkup.

HYSIM can draw graphs of some data it generates, but it doesn't let you draw your process or flow scheme on the PC screen. Back to pencil and paper for that.

HYSIM looks like a great program, and, for the price, it had better be. It seems to represent a real breakthrough in the design power chemical engineers can get with PCs. ■

HYSIM
Hyprotech, Ltd.
1700 Varsity Estates Dr. N.W.
Calgary, Alberta T3B 2W9
(403) 288-1718
List Price: $12,000
Requires: 512K RAM, 8087 coprocessor, two double-density disk drives (hard disk recommended). A game adapter card is provided.

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CIRCLE 196 ON READER SERVICE CARD

Teachers Reach Out And Touch with PCs

Teachers and students learn to use The Source and telecompute with their peers in other high schools while participating in the IBM/ETS Secondary School Computer Education Program.

Telecommunications, an application currently receiving little attention from educators, can change the character of the traditional classroom by linking students with the outside world. Successful interaction is, after all, one of the primary goals of education.

Teachers and students at 89 secondary schools in three states recently had the opportunity to extend the boundaries of their classrooms with the help of modems and communications software—and to experience the pitfalls of educational telecommunications. They participated in the IBM/Educational Testing Service (ETS) Secondary School Computer Education Program (see "An IBM First for Secondary Schools," *PC*, Volume 3 Number 6, for a full description of the program).

The Setup

IBM donated approximately 1,500 PCs and a substantial amount of software, teacher training, and technical support to institutions in New York, California, and Florida. Participating institutions were organized into 12 clusters, each made up of five to nine schools and one teacher training institution (TTI) to train and support teachers from that cluster's schools.

The Source Telecomputing Corporation and Tymnet, Inc., agreed to donate a

total of 3,700 hours of prime-time usage of The Source information service and Tymnet's telecommunications network. In addition, Hayes Microcomputer Products, Inc., gave more than 100 Smartmodems and copies of its *Smartcom II* telecommunications software to participating schools. However, each school was responsible for installing phone lines and paying for their use.

The telecommunications activities of schools participating in the IBM/ETS program fell into two general categories: administrative and instructional. The most frequent administrative activity involved the use of The Source's electronic mail facility for exchanging program information. Through The Source, news concerning discounts on educational software, hardware problems and solutions, teaching ideas, and teaching resources was distributed. For instance, when a teacher's question about a *Peachtext* formatting command could not be answered through the manual or other technical support sources, a call for help was broadcast to all schools.

Instructional Uses

Teachers used the PC's telecommunications capabilities for three types of instructional applications: to encourage interaction among participants in different schools while providing a basic introduction to telecomputing, to gather and analyze information, and to teach the technical aspects of data communications. For example, at Hudson Senior High School, in Hudson, Florida, teachers and pupils set up a telecommunications word puzzle to be solved using The Source's electronic mail system. Each school received a different clue to the puzzle's solution. To gather additional clues, students contacted their peers in the schools taking part in the exercise.

Cooperative Learning

Business class students and teachers at Owego Free Academy in Owego, New York, and Tioga High School, in Tioga

Illustration Carter Goodrich

Center, New York, participated in a cooperative learning project, which involved two programming teams, each made up of students from both schools. Members of each team exchanged the code they had written so that the pieces of the project could be integrated and tested as a single unit.

Students made good use of The Source for news gathering. For instance, at Chamberlain High School, in Tampa, Florida, instructors used The Source's financial information facilities to teach a course on the stock market to learning-disabled students. Students set up and followed three hypothetical stock portfolios, graphing weekly highs and lows and analyzing changes in relation to the Dow Jones Industrial Average.

To teach students about the technical aspects of communications, teachers at Santa Monica High School, in Santa Monica, California, worked with their classes to set up a local bulletin board. Students were responsible for developing ideas for new services and for rewriting the bulletin board program to incorporate these services. The board contained a calendar of school events, a message center for members of the school community and general public, and information on the uploading and downloading capability of the bulletin board project.

The Pitfalls

The integration of telecomputing into school life is not always smooth. For participants in the IBM/ETS program, the two most significant problems were obtaining necessary district approvals and difficult teaching conditions.

The incorporation of telecomputing into the schools entailed several approvals from administrators or their boards of education. Some administrators feared students would illegally tap into private data systems. To gain approval, some of the schools agreed to place the PCs in restricted areas, limiting computing activity to a select group of students.

Furthermore, the administrators responsible for approving the contract issued by The Source Telecomputing Corporation for use of its information utility felt that it was necessary to submit the contracts to their lawyers for a comprehensive review. While justified, such reviews—and the inevitable requests that follow for contract modifications—can cause substantial delays in bringing telecomputing into the classroom.

For telecomputing to be successfully

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CIRCLE 295 ON READER SERVICE CARD

integrated into the secondary school curriculum, teachers must have the proper support. Time was a precious commodity for the teachers participating in the IBM/ETS program. These teachers were responsible for organizing the donated equipment into a new computer lab, scheduling classes, developing lesson plans that incorporated the computer, and reviewing and learning how to operate new software. The added responsibility of learning the fundamentals of telecomputing was simply not practical for many of these individuals.

Instructor Attitudes

Some instructors participating in the program did not use telecommunications because they saw no immediate educational advantage to it. Instead of the financial, electronic mail, and other services offered by The Source, these teachers preferred to have access to CAI lessons, educational games, and databases directly relevant to English, history, math, and science. Other teachers saw little reason to invest time in learning to use telecommunications equipment because they feared that access to The Source and Tymnet would be cut off after the one-year period of the donation program ended. While the schools could keep the donated hardware and software, they would no longer have free access to the services of The Source and Tymnet.

> For telecomputing to be integrated into a school, teachers must have the proper support.

The obstacles to integration of telecommunications into the school routine can best be avoided by promptly securing administrative support, giving teachers the needed preparation time and an appreciation for the educational value of telecomputing, and keeping costs within the reach of the typical school system. The time and effort these measures entail are far outweighed by the benefits that telecommunications can bring to teachers and students. ■

Randy Elliot Bennett, an educational researcher, has published several articles and a book on the use of microcomputers in schools.

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Rating Managerial Skill

How good a manager are you? Thoughtware's new software aims to help you assess and improve your prowess. But management training is more than a matter of yes and no.

Thoughtware, Inc., produces software with an ambitious goal. By transplanting traditional management development training to the PC, its programs aim to help you change both "what you do and how you do it" to improve your management skills. The specific objective of *Assessing Personal Management Skills*, part of Thoughtware's Management Diagnostic Series, is to make you more aware of your managerial behavior.

Thoughtware eschews conventional menus for the thoughtree, a hierarchical map resembling an organizational chart. Thoughtree branches connect units of instruction through which you travel, by pressing the number of the unit you wish to study.

The thoughtree is a novel but slow and indirect method of organizing and accessing information. It spreads a menu that could fit on a single screen across eight displays, adding unnecessary searching and key-pressing to topic selection and browsing.

Exiting a unit deposits you at the top of the thoughtree rather than at a more convenient point such as the display on which you entered. As a result, moving between units that are adjacent on the screen means traversing the length of the entire thoughtree. If you stop work in the middle of a unit, you cannot return to the point where you stopped. And once you leave a unit, the information you've collected is lost.

Within each unit are questionnaires, typically several statements with numbered response scales reflecting agreement or disagreement. One example: "With all the things that middle managers in this organization have to do, it's unreasonable to expect them to spend much time developing the abilities of their subordinates." You respond to this statement by entering a number from 1 (strongly disagree) to 5 (strongly agree).

The program compares your responses to "norms," statistically analyzed scores of managers who have taken the same questionnaire. These comparisons are the basis for Thoughtware's assessments of your management behavior. You record your results on worksheets that include open-ended "thought" questions such as "How might you im-

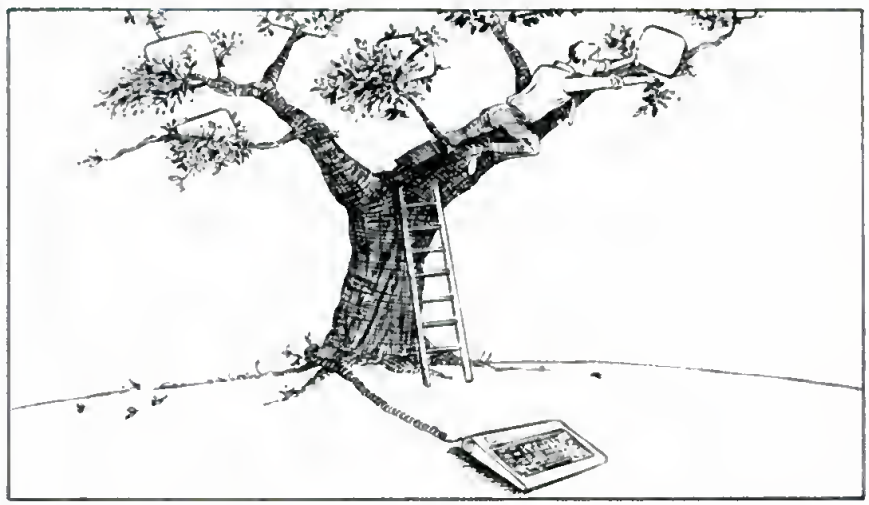

Illustration Kimberly Root

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prove your own ability to give constructive feedback? "

Talking Heads

One unit begins with a graphic of a woman's head. Her animated lips move as she asks, "How often have you observed employees working at cross purposes, or employees working in a great flurry of activity but without a clear sense of direction? " The talking head in the next display is a male manager who recites objectives, pausing for you to rate each as effective or ineffective by pressing *E* or *I*. Unfortunately, it's not until after this exercise ends that the program defines criteria for setting effective objectives.

Next you respond to statements on goals and objectives. One is clear and direct: "Do you establish measurable and realistic work targets and deadlines?" Others are ambiguous: "Do you adjust resources when performance measures show discrepancies?" What resources—air? water? salary? How much of a discrepancy and in which direction?

The assessment feedback following the questionnaire is prefaced by: "Please write down the following results on worksheet #8 and review the questions found there." Results are shown on a bar graph that compares your score to data that, according to the program, represent the responses of over 100,000 "people" from over 3,500 work groups. In one trial, the average score was 5.3; my score was 5.0. The program's assessment: "Your score was below the mean. You could probably benefit from some instruction. . . ."

Ambiguous Feedback

Thoughtware's approach to measuring attitudes is flawed, often through carelessness, making it difficult to draw useful conclusions. "Very poor score" and "very good score" are judgmental, suggesting pass/fail performance more appropriate to a test. Ratings and statistics can be intimidating, especially if not accompanied by information that puts them in perspective. The significance of a score that falls "below the mean" cannot be fairly judged without more information about the distribution of all scores.

On a survey about clarifying managerial responsibility, my score was 31, while the average score of 24,000 managers surveyed was 27. The explanation: "This means you define the scope of your responsibility in broad terms, which exceeds national norms. Too broad a scope of understanding of your role can result in diffuse or unfocused work performance." The program is fond of dropping the word "national," an adjective that lends authority to any noun. But the validity of a given conclusion depends on several factors, especially the number of studies on which it is based and the number and kinds of people studied. If you manage white-collar workers while managers in the control group oversee laborers, the comparison and hence your score are meaningless.

Language Arts

The assessment feedback is ambiguous also. It mentions the dangers of "too broad a scope" of role understanding, which can result in "diffuse or unfocused work performance." Does this mean I'm on the verge of losing my grip on my job? Is it a judgment, prediction, or fact? How should I react to it?

Another bothersome characteristic of the program is its language. Sentences strive to sound authentic and precise but end up pretentious and confusing: "Those who insist on the use of Thoughtware programs without experiencing one or more themselves, probably communicate shallowness."

Thoughtware claims that on the average, its Management Diagnostic Series "cuts the cost of staff development, in half by virtually eliminating instructor costs, the need for classroom facilities, and the cost of travel for trainer and trainee." Yet the realities of training resist cost-cutting more than Thoughtware thoughtlessly imagines. ■

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A menu-driven command directory that provides an English language interface to PC DOS. As you select individual functions from the menu, PC DOS Director defines the function, and on your command, issues the actual DOS command to DOS in order to execute the function.

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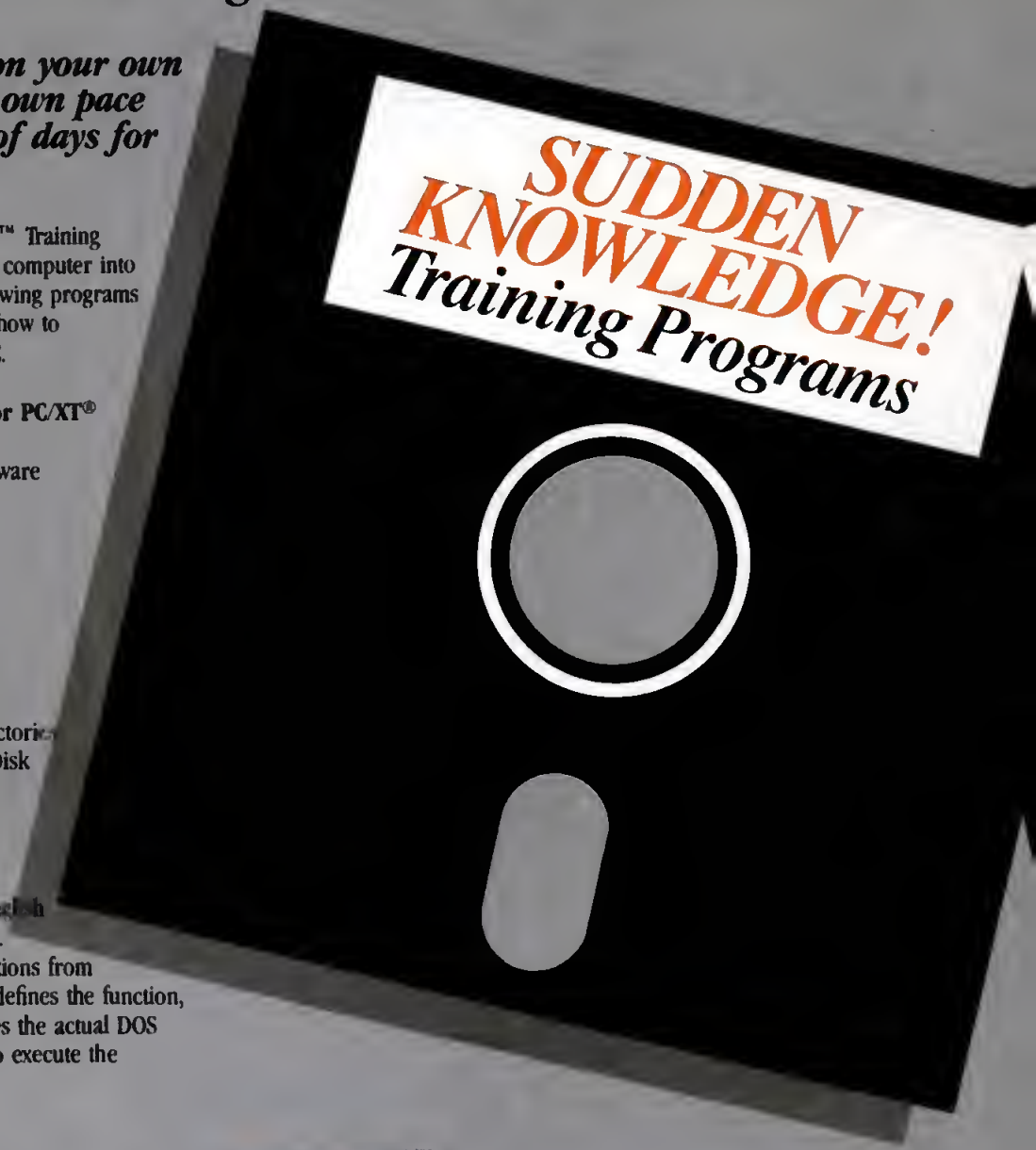

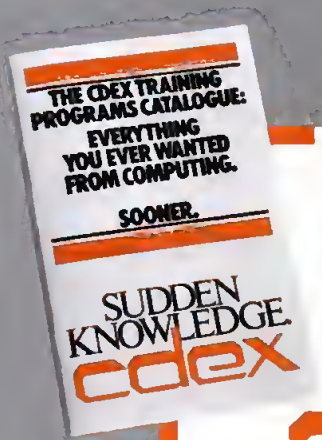

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CIRCLE 111 ON READER SERVICE CARD

New On The Market

HARDWARE

IHR Graphics Controller

A high-resolution graphics controller board incorporating its own 8088 microprocessor and a VLSI NEC 7220 graphics controller chip. These on-board IC chips permit the board to run complex graphics applications at resolutions of 1,024 × 1,024 dots without taxing the addressable screen memory in the user's system.

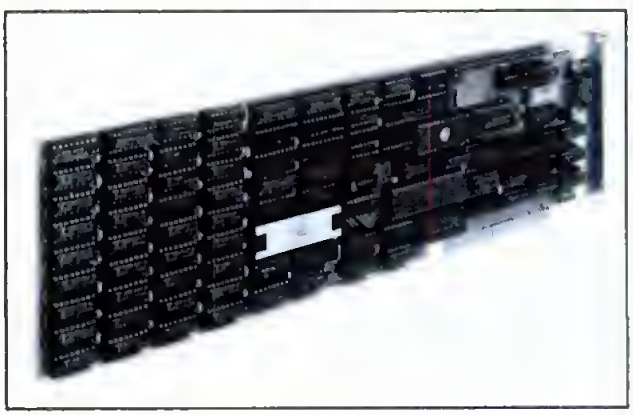
The controller is available in several configurations. The minimal configuration provides 1,024- by 1,024-dot resolution with two planes of memory (for four colors). Second and third planes of memory can be added to this configuration (for a maximum on-board memory total of 512K), allowing the simultaneous use of up to 16 colors. Finally, a color look-up table can be added allowing the user to choose 16 colors from a displayed palette of 4,096.

The board is compatible with software from DOS, BASIC, or BASICA, and includes C language routines for the NEC 7220. Other features include the ability to produce multiple windows under software control, with multiple screens held in on-board memory; external synchronization input; a light pen interface and standard RGB output; controllable pan, zoom, and scrolling; as well as hardware-based routines for drawing vectors, circles, arcs, rectangles, area fills, and graphics characters.

The board's display memory is not mapped, so it will not conflict with memory boards installed in the user's system. Up to two fully configured IHR Graphics Controller boards can be installed in the same system.

(List Price: Basic configuration, $1,295)
Frontier Technologies Corp.
P.O. Box 11238
3510 N. Oakland Ave.
Milwaukee, WI 53211
(414) 964-8689

CIRCLE 750 ON READER SERVICE CARD



***IHR Graphics Controller**, Frontier Technologies Corp.*

***Data Sentry**, Lockheed-Georgia Co.*

Data Sentry

An intelligent external modem capable of keeping a user's data secure without resorting to encryption algorithms or changes in systems programming. Used with an optional companion device called Remote-ON, the modem can also turn the user's system on from a remote terminal once security has been cleared.

In normal use, the modem's security routine requests the phone number of the caller. Then it hangs up and looks through its stored directory of authorized numbers. If the caller's number appears in the directory, the unit calls the number back and requests a password.

The caller gets three tries to give Data Sentry the right password. Without it, Data Sentry won't return further calls from that phone number. The modem automatically logs calls coming in with phone number, whether the calls were successful or not.

A lower security mode is also included, which lets users program the device to call back any number from which it gets the correct password. Alternatively, the user can choose to allow access to a system upon entry of only the correct password.

(List Price: $895; Remote-ON option, $145)
Lockheed-Georgia Co.
Marietta, GA 30063
(404) 951-0878
(404) 424-2701

CIRCLE 752 ON READER SERVICE CARD

CTS 212AH Modem

A Hayes-compatible standalone modem offering full-duplex, 300/1,200-bps operation. The CTS 212AH can operate in asynchronous communications mode at either 300 or 1,200 bps, and in synchronous mode at 1,200 bps.

The unit supports keyboard diagnostics including local or remote analog or digital loopback tests. Other features include adaptive dialing, DTMF tone or pulse dialing, auto-answer with speed detection, call-progress monitoring, auto-redial, and two RJ-11 jacks for both voice and data communications.

(List Price: $495)
CTS Corp.
131 West St.
Danbury, CT 06810
(203) 743-3681

CIRCLE 764 ON READER SERVICE CARD

Sola 1KVA UPS

An uninterruptible power supply built with two internal power supplies for continuous line power and battery charging. In the event of a sudden total power blackout, the unit can supply up to 1,000 volts AC for up to 12 minutes from its internal rechargeable lead-calcium battery, or up to 27 minutes with a separate, add-on battery pack.

The Sola 1KVA, available in both 50-Hz and 60-Hz models, incorporates a full-wave diode bridge to power its inverter circuitry and a linear, current-limited series-pass regulator to keep its internal battery recharged. This combination of supplies helps reduce the input power requirements 10 to 15 percent under other UPS devices in its class. The lower power requirements, coupled with reduced noise factors, results in more economical operating costs for the user.

Featuring a transistor-switching multiple pulse width inverter, the UPS holds output voltage within ±3 percent of nominal despite line voltage fluctuations of +10/-15 percent. The AC input circuit breaker, battery breaker, and inverter on/off switch are located on the unit's front panel. LED indicators and an audible alarm provide information on the unit's operating status at all times.

The battery pack is a sealed, 36-cell lead-calcium unit that supports 12 minutes of power at the rated level. A second battery pack can be added by the user to increase reserve power to 27 minutes. When line power is restored, the battery packs are automatically recharged as normal UPS output resumes.

(List Price: $2,955; 12-minute battery, $540; two batteries, $1,088)
Sola Electric
1717 Busse Rd.
Elk Grove Village, IL 60007
(312) 439-2800
(312) 228-1250

CIRCLE 772 ON READER SERVICE CARD

CTS 212AH Modem, CTS Corp.

VC-100-1 Color Monitor

A 16-color display monitor offering a dot pitch of 0.38 mm (compared to the IBM standard of 0.42 mm), resulting in sharper screen images. The 12-inch monitor can display 16 colors simultaneously, including such difficult-to-achieve colors as true brown, gray, and yellow. Colors hold their brilliance even at low-intensity settings.

(List Price: $595)
Vidstar
2114 Ringwood Ave.
San Jose, CA 95131
(408) 946-4036

CIRCLE 773 ON READER SERVICE CARD

Omega Diskless Memory Board

A multifunction board consisting of a main RAM board, capable of holding up to 1 megabyte of 256K chips, to which the user can add optional piggyback boards. The piggyback boards include such features as error checking and correction (ECC), serial and parallel ports, a clock/calendar, and a coprocessing module based on an Intel 80186 microprocessor.

The Omega Diskless Memory Board can be configured with either 64K or 256K RAM chips. With the 64K chips, the board can support a total of 256K RAM; the 256K chips allow the board a maximum of 1 megabyte. Included is an exclusive memory-mapping facility, allowing the user to easily establish the direct-addressable memory of the PC to its limit of 640K merely by setting the upper- and lower-limit switches. The remaining memory can be used as

RAMdisks through user-established port addresses. This allows the board to be used with existing RAM in the user's system. Up to 16 Omega Diskless Memory Boards can be installed in a single system through an expansion chassis.

An optional plug-on board allows the main board to incorporate error checking and correction features, with the capability of logging all errors found. This feature, normally found on mainframe systems, is crucial in those applications where data integrity is paramount.

The optional coprocessing module raises the throughput speed of the PC by a factor of up to four times average speed, using a true 16-bit 80186 microprocessor. Other coprocessor modules, built around a range of microprocessor chips, will be available in the future.

Each Omega Diskless Memory Board includes a disk with a program for setting and accessing the clock/calendar module, as well as an electronic drive and spooling program.
(List Price: With 256K RAM, $995)
Mega-Omega Systems Inc.
5477 Glen Lakes Dr., #108
Dallas, TX 75231
(214) 987-1340

CIRCLE 775 ON READER SERVICE CARD

SOFDEX, Colorado Computer Classics

SOFTWARE

SOFDEX

A file management program that creates a master index, labels, and descriptions of all files stored on diskettes. *SOFDEX*'s master file provides a 40-character field for describing what is in a file, matching the descriptions with the computer directory of filenames.

A built-in text editor allows the user to keep the master file current, to print labels for diskettes, and to generate a hardcopy directory. *SOFDEX* also incorporates the ability to produce indexed Rolodex-type file cards, 3 by 5 cards, and manila folder labels.

The software does not include a printed manual. Instead, on-screen ASCII graphics guide the user through the program's features and use. Also included with the package is *The Oxford Guide to Filing Efficiency*, a text on establishing efficient filing systems.
(List Price: $94.75)
Requires: 128K RAM, one drive, PC-DOS 2.0.
Colorado Computer Classics
800 Hayden
Longmont, CO 80501
(800) 835-2446
(303) 772-2782

CIRCLE 747 ON READER SERVICE CARD

PC-OrgChart

A program to produce organization charts. The menu-driven software can accept changes in personnel or chart structure, automatically producing a revised chart.
(List Price: $95)
Requires: 128K RAM, one disk drive, PC-DOS, Epson printer with Graftrax.
Norfolk Systems
8 N. Fork Rd.
Laurel Springs, NJ 08021
(609) 783-4483

CIRCLE 768 ON READER SERVICE CARD

Lettrix

A utility that prints characters on Epson, Gemini, or Riteman printers in a 24 × 16 dot matrix instead of the usual 9 × 9 matrix. This provides letter quality results from these inexpensive printers.

Lettrix stays in 32K of the system's memory while other software is in the foreground, activating as needed for printing. The user may choose up to six fonts within a single document from a range of twelve supplied. Each typeface can be compressed, expanded, doubled in height, boldfaced, continuously underlined, and italicized. Written in C and assembly language, it recognizes and uses the print commands of the user's own software.
(List Price: $98.50)
Requires: 128K RAM, one drive, PC-DOS 2.x.
Hammerlab
7301 Yale Station
New Haven, CT 06520
(203) 787-5884

CIRCLE 763 ON READER SERVICE CARD

Softerm PC

A communications program that can function either alone or as an extension to PC-DOS, allowing the user to access its communications features from other programs. *Softerm PC* includes emulations of 24 popular terminals in addition to basic TTY terminal emulation. Features include keyboard macros, a built-in phone book for automatic dialing, and simultaneous capture of data to print or disk.

The software allows concurrent communications to be added to such programs as Lotus's *1-2-3*, *dBASE II*, *WordStar*, and other PC software. With a single keystroke, the user can interrupt the program in use to activate *Softerm PC*'s features. If the user resumes working in the original program, *Softerm PC* will perform its designated tasks concurrently as a background operation.

Softerm PC*, *Softronics

Up to four communications ports and three printer ports can be supported through background processing queues. In its various terminal emulation modes, both conversational and block transfer communications are possible, with on-line help screens provided for keyboard definitions.

Softerm PC also provides file transfer capabilities, including support for the XMODEM protocol. Also included is the *Softrans* protocol, providing CRC-16 error checking and data compression. A flexible command language allows interactive execution of file tranfers or automatic execution of command files. Command files can also be queued to a port for background execution, allowing concurrent operation of file transfers with other programs in the foreground.
(List Price: $295)
Requires: 128K RAM, one disk drive, PC-DOS 2.0, asynchronous communications adapter.
Softronics
3639 New Getwell, #10
Memphis, TN 38118
(901) 683-6850

CIRCLE 774 ON READER SERVICE CARD

Market Link

A program permitting the user to access either the Dow Jones News/Retrieval Service or The Source commercial databases with single keystrokes to obtain investment data.

Additionally, the user can define up to 27 security symbols for automatic retrieval of quote information from the Dow Jones database. Quotes can be accessed in unattended operation at up to six user-defined times. Data so obtained are automatically stored to disk for later analysis.
(List Price: $59.95)
Requires: 128K RAM, one disk drive, PC-DOS, Hayes-compatible modem, authorized access to the Dow Jones News/Retrieval or The Source services.
Smith-Micro Software, Inc.
P.O. Box 7137
Huntington Beach, CA 92615
(714) 964-0412

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Basics of BASIC

A self-contained series of disk tutorials teaching the fundamentals of BASIC programming. *Basics of BASIC*, on two diskettes, contains 12 lessons designed to eliminate the need to refer to printed manuals, although a manual is included with reviews of each disk lesson, as well as additional practice material that tests content understanding.
(List Price: $99)
Requires: 64K RAM, one disk drive, PC-DOS.
Focus Media, Inc.
839 Stewart Ave.
Garden City, NY 11530
(516) 794-8900

CIRCLE 749 READER SERVICE CARD

Freestyle

An outline-based word processing system with line-drawing capability. Additionally, *Freestyle* has integrated spelling checkers, a mail list merger, a Wang-like glossary feature called Keyfiles, and an on-screen interactive tutorial. It can also make use of all IBM special character sets (such as Greek and other foreign languages, engineering, and math characters) with on-screen text enhancement and horizontal scrolling.

The software's Outline Zoom feature provides the user with an interactive relationship between an outline and the corresponding document. Changes to the outline are instantly reflected in the document and vice versa. For example, sections of text can be rearranged and reorganized simply by moving headings in the outline. This feature also allows documents to be outlined, with directions for the actual creation of the document stored in an Outline Reference file. The outline and its reference file can then be used as templates for future document preparation.

The Draw feature allows the user to create forms, Gantt charts, process diagrams, and organization charts without a separate graphics program in most applications. The Keyfiles feature allows documents to be assembled from previously created boilerplate text or format command files with a single keystroke.
(List Price: $295)
Requires: 192K RAM, one disk drive, PC-DOS.
Select Information Systems
Sir Francis Drake Blvd.
Kentfield, CA 94904
(415) 459-4003

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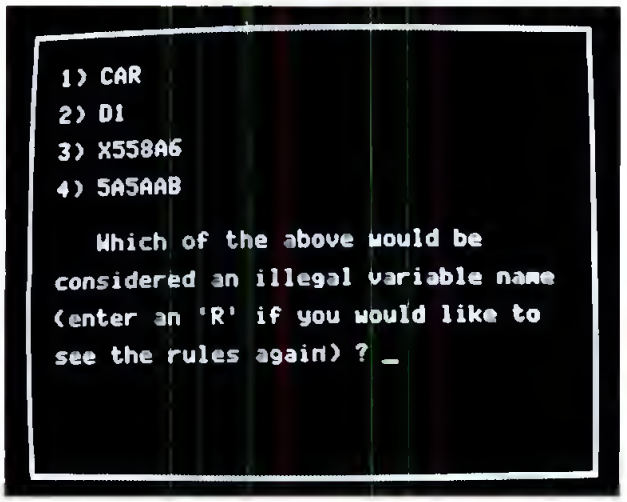

***Basics of BASIC**, Focus Media, Inc.*

The Impersonator

A communications program that can emulate virtually any asynchronous terminal and automatically "learn" network log on/off protocols. Designed to satisfy the needs of users at any level of computer experience, *The Impersonator* provides functions that range from a simple typewriter mode, in which the printer is enslaved to the user's keyboard, to a built-in programming language for automating complex sequences of multiple data transmissions.

The Impersonator is preprogrammed with emulations of the Lear Siegler ADM-3A, DEC VT-52 and VT-100, Hazeltine Esprit, IBM 3101, Data General D210, and the Televideo 912 terminals. It also provides simple teletype emulation. To further customize the program beyond simply emulating a specific terminal, and to configure the software to emulate additional terminals, the built-in programming aids include over 60 pages of help screens. These help screens provide context-sensitive information as needed at each stage of the software's use.

Features of the program also include auto-dialing, unattended file transferring, and the ability to redefine the output of any key. This last feature allows keyboard conformity with any async terminal protocol and the emulation of certain functions. The feature also allows the user to manually enter log-in procedures once, after which the software will perform the function with a single keystroke.
(List Price: $195)
Requires: 192K RAM, one disk drive, PC-DOS.
Direct.aid, Inc.
P.O. Box 4420
Boulder, CO 80306
(303) 442-8080

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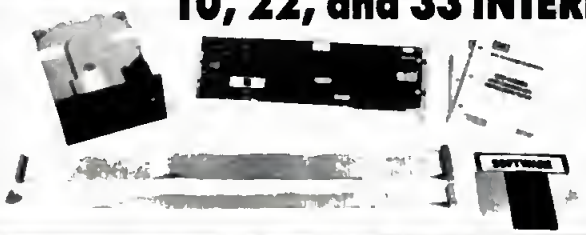

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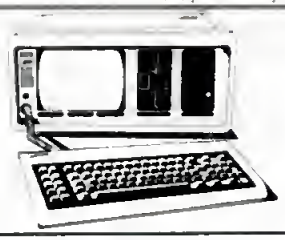

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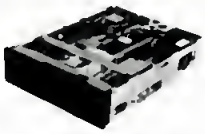

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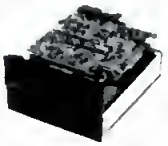

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(List Price: $79.50)

Requires: 128K RAM, one 320K drive, PC-DOS.

Courseware, Inc.
10075 Carroll Canyon Rd.
San Diego, CA 92131
(619) 578-1700

CIRCLE 757 ON READER SERVICE CARD

4-1-1

A content-based document locator capable of finding a file among hundreds that may be stored on the user's hard disk. *4-1-1* works in conjunction with the user's word processing program and other document editing systems to maintain a database of every word in every document filed with the software. Using the *4-1-1* indexes, documents can be located by content rather than by filename without resorting to special keywords.

The software presents the user with a spreadsheet-style "locate form," with which the user can specify the word or words that might be found in the needed document. Additionally, *4-1-1* provides a document-archiving system that backs up files and then provides an on-line index to files that have been moved from the hard disk to floppy disks.

A document security mode incorporated in the system uses a two-key encryption method that alters documents to prevent unauthorized access and use. *4-1-1* is compatible with files created by *WordStar* and with the Select line of word processing software.

(List Price: $149)

Requires: 256K RAM, hard disk, PC-DOS, word processor.

Select Information Systems
919 Sir Francis Drake Blvd.
Kentfield, CA 94904
(415) 459-4003

CIRCLE 754 ON READER SERVICE CARD

SalesPrompt

A menu-driven program designed to aid telephone or direct-sales people by rapidly correlating and displaying critical sales data. Some of the major elements of *SalesPrompt* include a product/features comparison chart, a features/benefits comparisons mode, and an instant-access word processing mode for taking notes.

The program's feature benefit mode stores facts about a company's products, as well as selling statements about each product. Up to three levels of data can be stored and later accessed, each level with progressively more detailed information. A keyword directory for rapid access to specific data is automatically created as features and benefits are entered.

The product versus features comparison chart uses independently scrolled columns to aid salespeople in matching the product and options available to a customer's needs.

Additional features of *SalesPrompt* include screen-editing utilities, a dynamic prompting system, automatic formatting, and fact-highlighting routines. Separate salesmen's packages are available to aid in creating individualized sales presentations.

(List Price: $495; salesmen's packages, $99)

Requires: 128K RAM, two 320K drives, UCSD p-System (supplied).

Infacs Corp.
240 Grand Ave.
Leonia, NJ 07605
(201) 947-0035

CIRCLE 748 READER SERVICE CARD

SalesPrompt, Infacs Corp.

C Utilities

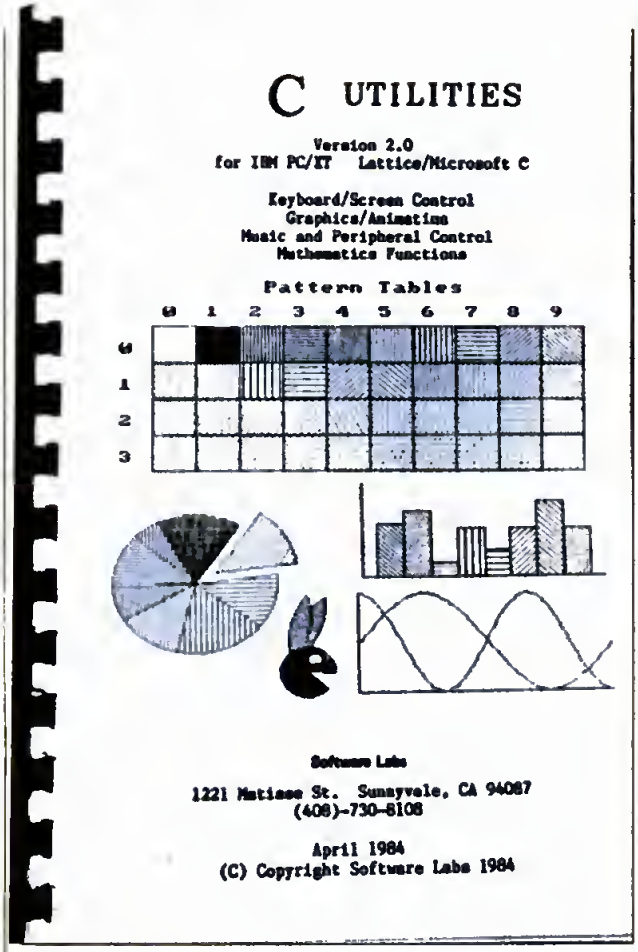
A set of programming tools enabling the C programmer to call functions that control screen attributes, peripherals, sound, graphics, animation, and math operations. All function algorithms are written in assembly language for speed of execution. The assembly modules form a separate code segment that does not require space from the 64K RAM code segment used by such C compilers as Lattice C and Microsoft C.

C Utilities is divided into functions as follows:

- Screen control, including functions for menu selection, function key selection, full-screen input, window scrolling, multiple-screen pages, inverse video, blinking characters, multiple color strings, and various cursor sizes.
- Peripheral control, providing a random number generator, date/time function, RS-232 serial port control, parallel printer port control, I/O port control, background music and sound generator, and a terminal emulator.
- Graphics, including functions for drawing dots, lines, circles, and ellipses. It also provides a graphics cursor and lightpen, mouse, and joystick support.
- Animation, with multiple-pattern fill, picture store, and picture animation.
- Math utilities, including sin, cosine, tan, arcsin, arccos, ln, log10, exp, power, root, and square root.

(List Price: $119)
Requires: 128K RAM, two disk drives, Lattice or Microsoft C compiler.
Software Labs
1221 Matisse St.
Sunnyvale, CA 94087
(408) 730-8108

CIRCLE 761 ON READER SERVICE CARD



C Utilities, Software Labs

Corporate Profiles

A program for managing personnel recruitment records. *Corporate Profiles*, designed for use with a hard disk, allows the user to maintain a database of prospective employee candidates. Using qualifying codes and weighting factors, the recruiter can precisely define the criteria for selecting candidates from the database. Reports can be generated for individual candidates or selected subsets of the database based upon entered criteria.

In addition, *Corporate Profiles* includes provisions for keeping track of all activities involved in the recruiting process, from the initial contact to final placement. To ensure confidentiality, access to candidate records is controlled through the use of a password security system.

The software is based upon the *KnowledgeMan* database management system. Users of *KnowledgeMan* can further extend *Corporate Profiles*'s capabilities in such areas as graphics, though the second program is not required.
(List Price: $600; with KnowledgeMan, $1,000)
Requires: 128K RAM, 10-MB hard disk, PC-DOS 2.0.
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P.O. Box 650
Spring House, PA 19477
(215) 643-7470

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(800) 547-3303
(503) 297-2321

CIRCLE 778 ON READER SERVICE CARD

MAC-INKER, Computer Friends

K-POWER Computer Book Series, Scholastic Books

PUBLICATIONS

K-POWER Computer Book Series

A series of BASIC program books written primarily to introduce children to programming through theme-oriented games they enter themselves at the keyboard. The series includes *Computer Space Adventures, Computer Monsters, Computer Craziness,* and *Computer Olympics,* by authors Paul Somerson and Stephen Manes. The series also teaches skills such as geometry and physics through the games played. Each book in the series contains dozens of BASIC programs.
(Cover Price: $4.95 each)
Scholastic Books
730 Broadway
New York, NY 10003
(212) 505-3000

CIRCLE 753 ON READER SERVICE CARD

The Technoletter

A newsletter intended for nontechnically oriented computer users. Each issue includes how-to articles on the more obscure and less

well-documented features of such software as *dBASE II*, Lotus's *1-2-3*, and *WordStar*. Sections called Horror Stories and Cute Tricks share the experiences of readers.
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Washington, DC 20036
(202) 293-0909

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Also covered is what to expect from computer programs, how to find computer classes, and how computer clubs are organized. Appendixes include a glossary of terms and a sample BASIC program.
(Cover Price: $12.95)
Chilton Book Co.
Radnor, PA 19089
(800) 345-1214
(215) 964-4000

CIRCLE 771 ON READER SERVICE CARD

***The First Family Computer Book*, Chilton Book Co.**

Desktop Graphics for the IBM PC

A guide to producing presentation quality business graphics. Taking an "instant" hands-on approach, author Corey Sandler presents a layman's introduction to graphing theory and statistics and explains the hardware and software options available on the market. Also included are detailed reviews of such popular graphics software as *VisiTrend/Plot*, *The Peachtree Business Graphics System*, *BPS Business Graphics*, and Lotus's *1-2-3*.
(Cover Price: $14.95)
Creative Computing Press
One Park Ave.
New York, NY 10016

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1. Please include the retail price, distribution methods, and details of both hardware and software requirements needed for an end-user to properly use your new product. For software especially, this includes required amount of RAM, number and type of disk drives, operating system(s) supported, and any peripheral equipment needed.
2. Releases should be typewritten double-spaced on one side of the paper. Copies of advertisements for the product may be included, but in most instances we need more information about a product than is typically included in an ad.
3. Include telephone contacts for marketing and technical questions.
4. If available, include black-and-white glossy photos of the product, 4 × 5 in. or larger.

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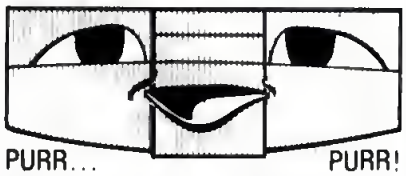

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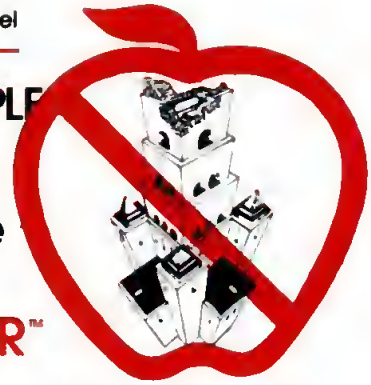

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PC User Groups

This list is a partial directory of PC user group names and addresses. Use this listing to locate other PC aficionados who congregate in your area or around the world.

OHIO

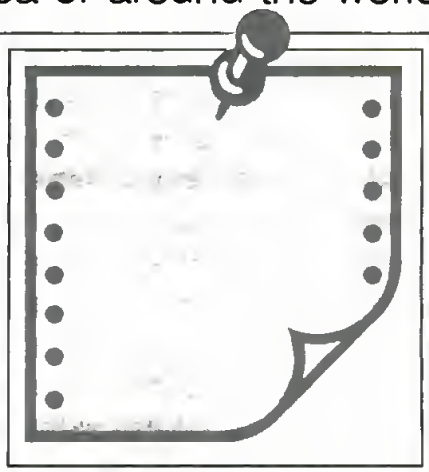
1BM-PC Users Club
c/o Chuck Harrington
315 Cutler Hall
Ohio University
Athens, OH 45701
(614) 594-6125

Northeast Ohio PC Club
c/o Kelvin Gerhart
P.O. Box 662
North Olmsted, OH 44070

Greater Cleveland PC Users Group
c/o Roy McCartney
30704 Royalview Dr.
Willowick, OH 44094
(216) 944-5173

Miami University IBM-PC Users Group
c/o Debra Allison
The Computing Center
Miami University
Oxford, OH 45056

Mansfield Area IBM PC Users Group
c/o Gary Stiffler
1145 Conwell Ave.
Willard, OH 44890



Akron/Canton PC Users Group
c/o James C. Finucane
10690 Clapsaddle Ave.
Alliance, OH 44601
(216) 935-0252

Columbus 1BM-PC S1G
c/o Frank R. Neal
1358 Byron Ave.
Columbus, OH 43227
(613) 239-9300

The Ohio State University 1BM PC-Users' Group
c/o Art Krumsee
Office of Continuing Education
210 Sullivant Hall
1813 North High St.
Columbus, OH 43212

OKLAHOMA

1BM PC Users Group
c/o Roger Baresel
Deloitte Haskins & Sells
700 Fidelity Plaza
Oklahoma City, OK 73102
(405) 232-6191

1BM Personal Computer Users Group (PCBUG)
c/o Lynn Long
P.O. Box 471114
Tulsa, OK 74147-1114
(918) 749-6396
(918) 628-1400

PC will publish a periodic listing of PC user groups. Send new addresses or address changes to "Club News," *PC*, One Park Ave., New York, NY 10016. New groups and address changes are shown entirely in **boldface.**

OREGON

PC Users Group
c/o Greg Estes
P.O. Box 5070
Eugene, OR 97405

Portland PC Users Club
P.O. Box 2068
Beaverton, OR 97075

Corvallis PC Computer Club
c/o Bob Collins
P.O. Box 1977
Corvallis, OR 97339

PENNSYLVANIA

International Personal Computer Owners
c/o James B. Cookinham
IPCO Inc.
P.O. Box 10426
Pittsburgh, PA 15234
(216) 757-1871
CompuServe: 71545467

Harrisburg PC Users Group
c/o Jack Stahl
1195 Fairmont Dr.
Harrisburg, PA 17112
(717) 652-9097

Microcomputer User Group (MUG)
The Pennsylvania State University
Computation Center
Computer Building
University Park, PA 16802

Philadelphia Area IBM PC Club
c/o Bennett Landsman
2041 Harbour Dr.
Palmyra, NJ 08065
(609) 786-1441

Pennsylvania IBM Group
c/o Ron Kester
1018 Greenlawn Dr.
Pittsburgh, PA 15216
(412) 381-2898

RHODE ISLAND

Rhode Island PC Users Group
c/o Mike Mahoney
University of Rhode Island
Tyler Hall
Kingston, RI 02881
(401) 792-2301

SOUTH CAROLINA

Palmetto Personal Computer Club
P.O. Box 2046
Columbia, SC 29202

Upstate IBM-PC Users Group
c/o Gary Teska
1102 Fork Shoals Rd.
Simpsonville, SC 29681
(803) 243-3970

TENNESSEE

IBM PC User Group
c/o Ross Burrus
Science Applications, Inc.
Plaza Tower, #801
Oak Ridge, TN 37830
(615) 482-6649

Memphis Area IBM-PC Users' Group
c/o Peter Vermilye
P.O. Box 241756
Memphis, TN 38122
(901) 345-8760

TEXAS

Bay Area Personal Computer Organization (BAPCO)
c/o Earl Rubenstein
P.O. Box 58098
Houston, TX 77058-8098

Centex PC Users Group
c/o Patti Anderson
P.O. Box 10169
Austin, TX 78766-1169
(512) 458-6996

Houston Area League of PC Users
c/o Duane C. Hendricks
P.O. Box 610001
Houston, TX 77208
(713) 831-3367
(713) 772-1371

Dallas-Fort Worth User Club
c/o Samuel P. Cook
309 Lincolnshire
Irving, TX 75061
(214) 253-6979

West Texas Personal Computer Users Group
P.O. Box 8951
Amarillo, TX 79114

Texas User Group
c/o Ken Holcombe
178 Tipperary
San Antonio, TX 78223
(512) 333-7163

Southwest IBM PC Users Group
c/o William G. Barker & Associates
1009 West Randol Mill Rd., #212
Arlington, TX 76012

North Texas IBM-PC Users Group
2025 Rockcreek Dr.
Arlington, TX 76010

Longview Users Group
c/o Ron Ferguson
P.O. Box 2504
Longview, TX 75606
(214) 753-2292
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UTAH

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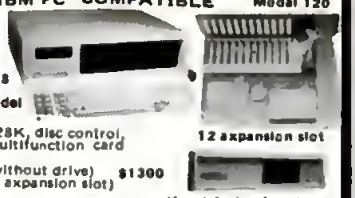

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Fractals and The IBM PC

How do you figure the volume of a cloud or the surface area of a piece of cauliflower? With fractal dimensioning.

This is the first in a two-part series on fractional dimensions, or fractals, and the IBM PC. This installment includes a program listing for KOCH.BAS, a Koch curve generator. The second article will cover the use of a fractal algorithm for describing natural objects.

How long is the coast of England? Put some sailors in a rowboat and send them out with measuring sticks, and in e month or two you'll have an answer. But the accuracy of their answer depends on the measuring device they use. The measurement they'll get if they carry a 10-foot pole will be quite different from the one they'll get if they use a 6-inch ruler. And both of these answers will differ from the measurement obtained from satellite pictures. With an irregular boundary like a coastline, the closer you look, the longer the measured coastline appears and the more detail you'll see. Yet the overall pattern remains the same whether we look from 2 feet or 2 miles eway.

When Euclid described his geometry, he wrote of planes and lines and points, not surfaces crawling with irregularities. Yet portraying the real world on a computer means modeling it on those strange wrinkled objects. Spheres or flat planes just won't do the job properly—e meteorologist needs a better description of a cloud; an anesthesiologist, a better model of bronchial capacity.

Entering the 1½ Dimension

Euclid devised methods for dealing with "dimensionally concordant" sets of objects—objects with dimensions that coincide. But when we look at the real world—at the surface of a cloud, the volume of the circulatory system, or the area of a tree or e piece of cauliflower—we find examples that don't fit Euclid's system. These natural objects can be called "dimensionally discordant."

Topologists in the last hundred years developed a method for describing such complex shapes. Their work resulted in a whole new form of dimensioning in which the dimension isn't required to be an integer; hence the name "fractional dimen-

Illustration: Carter Goodrich

```
10 '   KOCH.BAS -- Koch curve generator  -- (C) 1984, S M Eatvenik
20 '
30 '   This progrea usee e equere ee en initietor, defines e
40 '   generetor (s seriee of linee that redefine each etreight
50 '   line, but with no difference to the aree), theo redreve
60 '   the eep each tise et e finer level of deteil.
70 '
80 '*********************************************************
90 '
100 DEFINT A-Z:KEY OFF
110 DIM P(2500,3,1)
120 DIR RI(4),RJ(4)
130 GOSUB 4000 'eetup data
140 S=4:OEBERATOR$="FLRRFLLB"  'forward, left, etc
150 S1=0:S2=1:C=1
155 KEY OFF:SCREEN 1,0:CLS
160 LINE (P(1,1,0),P(1,2,0))-(P(3,1,0),P(3,2,0)),C,B
180 FOR L=1 TO 3
181 C=C+1:IF C>3 THEN C=1
185 GOSUB 1000 'drev enother level of deteil
190 IF S1=0 THER S1=1 ELSE S1=0
200 IF S2=0 THEN S2=1 ELSE S2=0
210 REXT
220 X$=INPUT$(1)
290 ENO
300 '
1000 '************************************ drev e level of koch curve
1005 '
1010 M=1
1015 UNIT=ABS(P(1,1,S1)-P(2,1,S1))/3 'unit length
1016 IF UNIT=0 THER UNIT=ARR(P(1,2,S1)-P(2,2,S1))/3 'unit length
1020 FOR R=1 TO RPTS
1030 I=P(R,1,S1)
1040 J=P(R,2,S1)
1050 OIR=P(R,3,S1)
1060    FOR K=1 TO LEN(GERERATOR$)
1070    X$=RID$(OERERATOR$,K,1)   'get next coeeend froe generator
1080    IF X$="L" THEN OIR=DIR-1:IF OIR<1 THEN OIR=4
1085    IF X$="R" THEN DIR=DIR+1:IF DIR>4 TREN OIR=1
1090    NXI=I+RI(DIR)*UNIT  'offeet to next point
1095    NXJ=J+RJ(DIR)*UNIT
1100    LINE (I,J)-(NXI,NXJ),C
1110    P(M,1,S2)=I
1112    P(M,2,S2)=J
1114    P(M,3,S2)=DIR
1115    I=NXI:J=NXJ
1120    M=M+1
1130    NEXT K
1140 NEXT R
1150 RPTS=M
1990 RETURN
2000 '
4000 '************************************ eetup
4005 '
4010 FOR I=1 TO 4:READ RI(I):NEXT
4020 FOR I=1 TO 4:READ RJ(I):NEXT
4030 DATA     1,0,-1,0,     0,1,0,-1
4040 FOR I=1 TO 4:READ P(I,1,0),P(I,2,0),P(I,3,0):NEXT  'x, y, direction
4050 DATA 100,35,1,   220,35,2,   220,163,3,   100,163,4 :' center initial square
4060 RPTS=4 'current number of points
4090 RETURN
```

Figure 1: *KOCH.BAS curve generator.*

sion," or more simply "fractal."

As with so many other mathematical topics, only a few years ago it took the equivalent of a Cray supercomputer to do the research. Now it's possible to investigate these ideas on the IBM PC. Although you won't be able to create a model of the Grand Canyon with all its layers, you can still examine how such models work and create interesting PC landscapes.

The PC is orders of magnitude away from the bigger machines. In its highest-resolution mode, it can handle only 640 × 200 dots, or "pixels." Standard video commonly uses 512 × 512 pixels, while 70mm film requires 4,000 × 6,000. That's 24 million pixels, or about 3 megabytes of data, per frame. Even on mainframes, a hard disk pack can store only about 256 megabytes or about 80 frames of pictures, which yields only about 3 seconds worth of animation.

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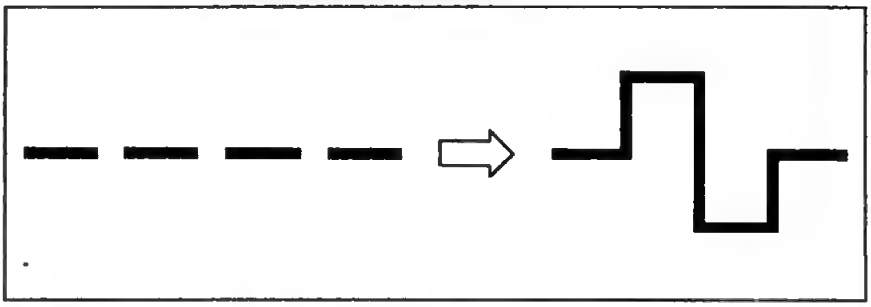

Figure 2: *Construction of the curve generator used in the program listed in Figure 1.*

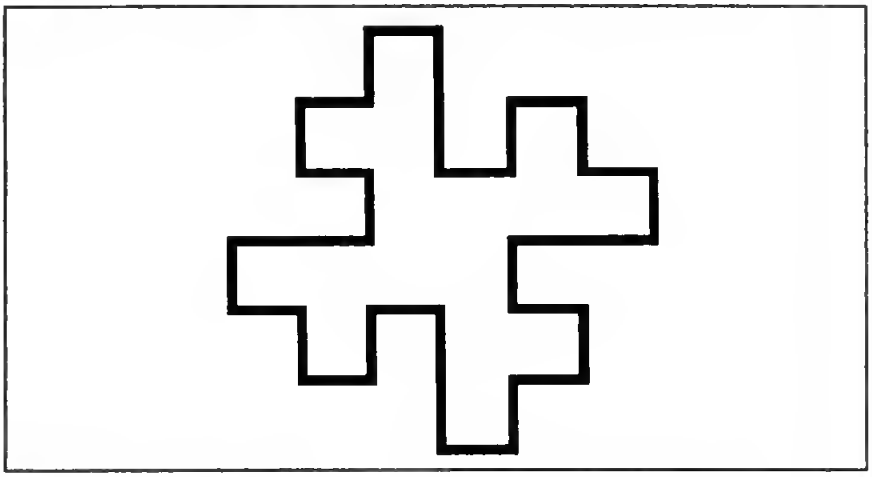

Figure 3: *A first-generation Koch curve achieved by applying the generator shown in Figure 2 to four sides of a square.*

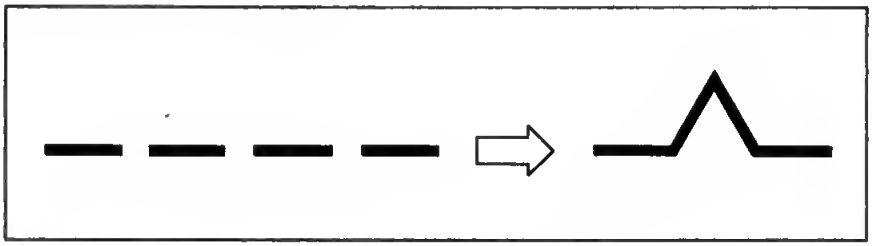

Figure 4: *Generator for the program in Figure 1 using a non-square initiator.*

linear polygons. They are formed by repeated application of a set of rules to each side of a polygon. In each repetition, the number of sides on the polygon increases, the sides become smaller, and the detail finer until the limit of the display's resolution is reached. (The display can be anything from a pen-and-ink construction to a high-quality CRT.)

A program to create a Koch curve is shown in Figure 1. It starts with a square called an *initiator*, which can be any polygon or curve. Usually the initiator is a regular polygon such as a square, equilateral triangle, or hexagon. Then the program designs a *generator* or a set of rules for changing each line of the initiator. The program in Figure 1 uses a generator that says "go forward ¼, turn left ¼, then right, right, forward, left, left, and right." This will take a line, divide it into four segments, and change it as shown in Figure 2. This is repeated for each side of the square, yielding the shape in Figure 3.

Next, each new side is broken into four sections, and the generator is applied to these. While in theory this process can continue indefinitely, we quickly reach the limits of the PC's resolution. Note that in this version of the generator, the area above the initial line in Figure 2 is the same as the area below. This means that however many times the generator is applied to the pattern, the area will stay the same. However, the circumference will continue to increase.

The KOCH.BAS program in Figure 1 allows testing of various generators. The initial square is set to maximize the number of generations that will appear on the screen. It is a square measuring 128 × 128 pixels, with coordinates that are initialized in lines 4040–4050. P( ) is a three-dimensional array, defined as P(2500,3,1), that lists the line segments.

The first dimension lists the segments in order, so P(34,i,k) would refer to the 34th segment. The second dimension has three elements. P(i,1,j) refers to the horizontal pixel coordinate of the i'th segment. P(i,2,j) refers to the vertical coordinate, and P(i,3,j) stores the direction of that line segment, where 1 is east, 2 is south, 3 is west, and 4 is north.

As the program constructs the curve, it must store the new line segments before it reads the old line. The simplest way to do this is to keep two lists. On the first pass, it reads line segments from list 1 and stores the new (and longer) list in list 2. Then it reads list 2 and stores the new list in list 1. To simplify programming, I set up the third element of the P( ) array to act as a pointer. The two lists are contained in the array P( ) and are switched back and forth as the iterations proceed. Thus P(i,j,S1) will read the i'th line segment for the pass and store the resulting values in P(k,j,S2). When the pass is complete, the values of the switches S1 and S2 are swapped.

An initial routine sets up the starting position and defines the relative *x* and *y* movements for each of four directions. For example, to move in direction 2, just add RI(2) to the current *x* and RJ(2) to the

current *y*. The program then defines a generator and makes three passes at drawing the square, using a finer level of detail with each pass.

Each pass calls the subroutine starting at line 1000. First, the subroutine calculates the unit length of the current line segments (in lines 1015–1016). It then examines each current line segment (in lines 1020–1140). The generator is applied to the line segment, one command at a time (lines 1060–1130).

Three commands are possible: go forward, turn left, or turn right. When a command for a turn is found, the turn is executed and the line segment drawn, so "L" really means turn left and go forward. For each line command the new *x* and *y* positions are calculated (in lines 1090–1095), the new line is drawn, and the new list is updated to include the new endpoint (in lines 1110–1115). Each pass of the subroutine starts with an array of NPTS points. While the subroutine operates, a new array is built with M elements. At the end, NPTS is set to M (in line 1150).

You can experiment with the program in Figure 1 to produce other Koch curves. For example, try the generator "LRRLRLLR" or "LFRRFLRFLLFR" in place of the existing one in line 140. Further projects could test the results of generators that divide the line into three or eight parts. (In this case, be sure to set B in line 140 to the number of line segments.) Or you could rewrite the program to use triangles or hexagons as initiators. If you experiment with such initiators, however, you'll need commands other than F, L, and R. You might want to have generators that use angles like the ones pictured in Figure 4.

Koch curves give some insight into the problems of measuring fractal objects, but they are completely predictable—each level is exactly like the one before. This property is called self-similarity. Natural objects are not exactly self-similar, but they are statistically self-similar. If we sample different areas at different magnifications, we can describe average forms for these natural objects. This statistical feature is the key to a sophisticated fractal algorithm that will be covered next issue. ■

Stephen Estvanik is an independent consultant and programmer who specializes in scientific applications and microcomputers.

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EDITED BY PAUL SOMERSON

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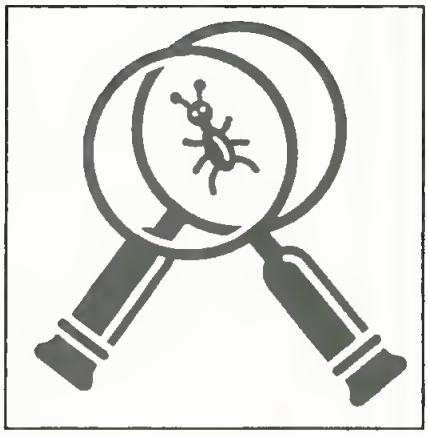

Repeat Performance

In my work helping business users of IBM PCs, I have found that not enough users have discovered the F3 key. This key can be used while in DOS to repeat the last command, a great time-saving trick. It works because the operating system maintains a template that saves the last DOS command you typed. The template is displayed when you hit the F3 key; you can then use it as all or part of your next command.

But there's another interesting and little-used trick with the F3 key. Usually when you want to repeat a command, it's not the last command, but the one before that. For instance, often a problem will occur because you were in the wrong place when you tried a command the first time. Either the logged disk drive was B: instead of A: or you were in a subdirectory instead of the root directory. Unfortunately, it takes a DOS command to move to the right place (either A: to switch the logged disk drive, or CD to change the current directory). This command becomes the one stored in the template, so that you lose the command you wanted to repeat.

It would be nice if you could repeat the DOS command just prior to the last one. You can do this on UNIX. In fact, UNIX keeps a session log of all your DOS commands and allows you to reuse any of them. Well, yes, Virginia, there is a Santa Claus.

Let's say your initial command is:

```
COPY AUTOEXEC.BAT
B:AUTO2BAT.LIB
```

but it doesn't work because you were logged onto drive B: instead of drive A: where AUTOEXEC.BAT is located. To change the logged disk drive and still retain the first command in the template for later use, do this:

1. Press the Ins key and type A: (this inserts A: into the template).
2. Hit the spacebar.
3. Hit the F3 function key, then hit the Enter key.

DOS now executes this line:

```
A: COPY AUTOEXEC.BAT
B: AUTO2BAT.LIB
```

but DOS sees only A:, the first command on the line, since there is a space after it. DOS makes sense out of that and simply looks no further.

To retrieve the initial command, trim the template using the Del key. Simply hit the Del key twice, once for each character

in A:. Then hit F3, and you've got the initial command back again to execute just by hitting the Enter key:

```
COPY AUTOEXEC.BAT
B:AUTO2BAT.LIB
```

Kendall Callas
San Francisco, California

The F3 key is a valuable tool, and this twist makes it even better. It would be awfully handy if there were a way of doing this in BASICA as well. Does anyone know a PEEK or other technique for retrieving the last BASICA command? If so, the instruction could be hooked into a function key to allow BASICA programmers to save lots of steps.

Patching Typing Tutor

After reading Gary Kaplan's article ("Bye-Bye Qwerty," *PC*, Volume 3 Number 1), I decided to experiment with the Dvorak keyboard layout using *ProKey*'s LAYOUT command. Never having used Dvorak before, I decided to use IBM's *Typing Tutor* to learn the layout. *Typing Tutor*, however, teaches only the Qwerty layout.

I then examined one of *Typing Tutor*'s subprograms, TT.BAS, and I found a way to modify the program for the Dvorak layout. First, start with an unused copy of *Typing Tutor* (once the disk is used, information on student progress added to the disk limits users to the Qwerty sequence). DISKCOPY it to a blank formatted disk, which will become the working copy of *Typing Tutor* for the Dvorak layout only. Next, prepare the working copy as explained on pages 11 and 12 of the user manual. Then, insert the working copy in drive A:, and load BASIC. From BASIC, load TT.BAS. Then change the lines in Figure 1, and save TT.BAS.

Jeff Gealow
McHenry, Illinois

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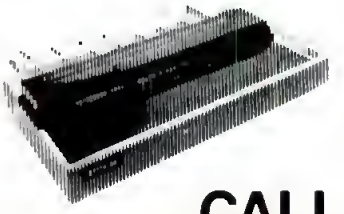

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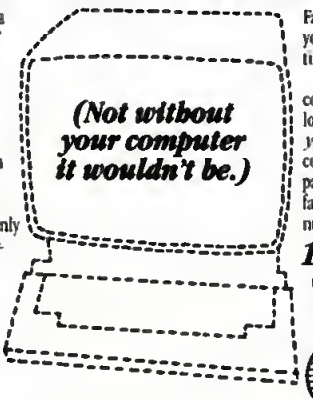

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```
Figure 1:  Patchee to IBN'e Typing Tutor for Ovorak layout.

Replace line:
3230 KB$="aedfjkl;eiruvoqpghtyvebnc,x.z/473B291056:'"+CHR$(34)+"$&#*@(!)%^<>"
with:
3230 KB$="aoeuhtne.cpg,r/lidyfkmxbjvqv;z1234567890:-_!@#$%^&*()<>"

Replace line:
3235 KB$=KB$+"[]?-=()_+\|'~"
with:
3235 KB$=KB$+"']?=[{+CHR$(34)+"}+{\|'~"

Replace line:
3240 KC$="        dkfjsla;fjrufjvmdksla;fjdkela;47;;"+  "'"   +"4738291056,."
with:
3240 KC$="        etuhonaeuhpguhkmetonaeuhetonae12ee"+  "-"   +"1234567890vv"

Replace line:
3245 KC$=KC$+"p[;0-[]-=a\'"
with:
3245 KC$=KC$+"1'e8='][a\-'"
```

Figure 1: *This program potches IBM's* Typing Tutor *to o Dvorok keyboard layout.*

```
100 'MULTI.BAS -Multiplication of long nuebere-Max Chandivert-B40602
110 CLS:KEY OFF:WIDTN BO:OPTION BASE 1:DEFINT A-Z:DIM C$(255),L(255)
120 INPUT "Enter first nueber: ",AI$
130 INPUT "Enter eecond nueber: ",BI$
140 FLAG=0:IF LEFT$(AI$,1)="-" TNEN FLAG=1 ELSE GOTO 170
150 IF LEFT$(BI$,1)="-" TNEN FLAG=0
160 GOTO 180
170 IF LEFT$(BI$,1)="-" THEN FLAG=1
180 IF LEFT$(AI$,1)="+" OR LEFT$(AI$,1)="-" THEH AI$=RIGHT$(AI$,LEN(AI$)-1)
190 IF LEFT$(BI$,1)="+" OR LEFT$(BI$,1)="-" TNEN BI$=RIGNT$(BI$,LEN(BI$)-1)
200 IN=INSTR(1,AI$,".") 'record position of decimal point if prepent
210 IF IN=0 TNEN 230
220 INA=LEN(AI$)-IN:AI$=LEFT$(AI$,IN-1)+RIGHT$(AI$,INA)
230 JN=INSTR(1,BI$,".")
240 IF JN=0 TNEN 260
250 JNB=LEN(BI$)-JN:BI$=LEFT$(BI$,JN-1)+RIGNT$(BI$,JNB)
260 IF IN=0 TNEN INA=0
270 IF JN=0 TNEN JNB=0
280 IJ!=INA+JNB
290 IF LEN(AI$)<LEN(BI$) THEN 300 ELSE 310 'place ehorter nueber as eultiplier
300 A$=BI$:B$=AI$:GOTO 320
310 A$=AI$:B$=BI$
320 LA=LEN(A$):LB=LEN(B$):LC!=LA+LB:IF LC! >252 THEN BEEP
330 PRINT "# of digite in both numbere =";LC!
340 PRINT "# of decieal placee in both nuebere =";IJ!
350 FOR I=LB TO 1 STEP -1 'multiply multiplicand by eaoh digit of eultiplier
360 BUF=0:NB=VAL(MIO$(B$,I,1))
370 FOR J=LA TO 1 STEP -1
380 NA=VAL(NIO$(A$,J,1)):NC=NA*NB +BUF:NC$=STR$(NC)
390 IF LEN(NC$)=2 TNEN BUF=VAL(LEFT$(NC$,1)) ELSE BUF=VAL(LEFT$(NC$,2))
400 MC$=RIGNT$(NC$,1):C$(I)=NC$+C$(I):IF J<>1 THEN 420
410 C$(I)=STR$(BUF)+C$(I)
420 NEXT
430 L(I)=LEN(C$(I))
440 NEXT
450 BUF=0:INO=0:P$="" 'addition of intereediate products
460 FOR N!=1 TO LC!
```

(Figure 2 continues)

Figure 2: *You con use this progrom to multiply numbers up to 252 digits eoch. Compile it for foster results when working with two extremely long numbers.*

(continued)

```
470 SUM=0
480 FOR K=0 TO LB-1
490 P=LB-K:M!=L(P)-N!+K+1:IF (M!<1) OR (M!>253) THEN 510
500 SUM=SUM+VAL(MID$(C$(P),M!,1))
510 NEXT
520 SUM=BUF+SUM:SUM$=STR$(SUM):LSUM=LEN(SUM$)
530 BUF=VAL(MID$(SUM$,LSUM-1,1)):P$=RIGHT$(SUM$,1)+P$
540 IF (LC!-N!<254) THEN 560
550 P$="":IND=IND+1
560 NEXT
570 IF IJ!>IND THEN IJ!=IJ!-IND ELSE IJ!=0 'restore decimal point
580 LC!=LC!-IND:P$=LEFT$(P$,LC!-IJ!)+"."+RIGHT$(P$,IJ!)
590 IF LEFT$(P$,1)="0" THEN P$=RIGHT$(P$,LEN(P$)-1) 'delete a leading zero
600 IF FLAG=1 THEN P$="-"+P$ 'restore minus sign
610 BEEP:PRINT:PRINT "PRODUCT=";P$
620 PRINT:PRINT "Want to calculate another product (Y/N)?"
630 Q$=INKEY$:IF Q$="" THEN 630
640 IF Q$<>"Y" AND Q$<>"y" THEN 660
650 CLEAR:GOTO 110
660 END
```

(Figure 2 ends)

```
100 ' MAKEMONO.BAS -- Creates MONO.COM -- by Joe Mocker
110 PRINT "Creating MONO.COM (which disables color) ..."
120 OPEN "MONO.COM" FOR OUTPUT AS #1
130 FOR CNT=1 TO 10:TOT=0
140 FOR SUB=1 TO 12:READ CUR:TOT=TOT+CUR
150 PRINT #1,CHR$(CUR);
160 NEXT:READ CUR:IF TOT<>CUR THEN 190
170 NEXT:FOR R=1 TO 8:PRINT #1,CHR$(0);:NEXT
180 CLOSE 1:PRINT :PRINT "MONO.COM created.":END
190 PRINT "BAD DATA IN LINE"49990!+10*CNT:BEEP:END
50000 DATA 235,89,144,1,0,80,83,81,82,30,250,186,1261
50010 DATA 218,3,236,169,8,0,116,250,176,37,186,216,1615
50020 DATA 3,238,46,139,30,3,1,184,0,184,142,216,1186
50030 DATA 176,15,185,80,0,138,39,128,252,7,116,2,1138
50040 DATA 136,7,67,67,224,243,184,64,0,142,216,83,1433
50050 DATA 187,101,0,138,7,186,216,3,238,91,31,129,1327
50060 DATA 251,162,15,126,3,187,1,0,46,137,30,3,961
50070 DATA 1,251,90,89,91,88,207,250,30,51,192,142,1482
50080 DATA 216,190,112,0,184,5,1,137,4,70,70,140,1129
50090 DATA 200,137,4,31,251,186,91,1,205,39,0,0,1145
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Figure 3: *This MAKEMONO.BAS program creates a MONO.COM utility to disable color when using a color graphics board with a monochrome monitor.*

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USER-TO-USER

want to make the difficult switch from Qwerty to Dvorak.

Fantasy on Strings

The numbers the PC can handle are limited in size by the way in which the PC stores digits. Under the Intel format the maximum number of significant digits in double precision is 16. Under the IEEE format using the 8087, the maximum is 20 in temporary real format.

At times, you might want to manipulate numbers with many more digits—when dealing with number theory, evaluating limits, or doing cryptography, for example. The PC has the necessary logic; the only problem is storage.

The MULTI.BAS program (see Figure 2) can help your PC multiply two numbers of up to 252 digits each. The scheme used here enters the numbers as strings rather than numerical constants. The program then manipulates the digits one at a time. It transforms each one into a number and processes it arithmetically. The result is retransformed into characters, to be stored in a string again. The limit of 252 digits is set so that each number (multiplicand or multiplier) can fit into string storage, allowing for a possible plus or minus sign, a possible decimal point, and the leading byte, which indicates string length.

When you multiply two numbers of such length, the product may sometimes exceed the maximum string length allowed. In that case, the program beeps just before printing LC, the total number of digits in both entries, and IJ, the total number of digits the result will have to the right of the decimal point. The program performs the multiplication without truncating the product, but it does not enter digits into the string, storing the product until it's no longer than 252 characters. When you have one long and one short number, the program works fairly quickly. When you have two long numbers, using a compiled version of the program is preferable.

Though not a programming model, MULTI.BAS shows how useful for computations the BASIC string-handling facilities in the PC can be.

Max G. Chandivert
Huntingdale, Australia

True enough. If you try this, do compile it; it really flies.

Color Killer

Many computer owners have a color graphics board, but use it with a green or other single-color screen. They find some programs just about impossible to use because the color isn't a combination of white and black. MONO.COM, created by the MAKEMONO.BAS program in Figure 3, continuously scans the first page of screen memory, changing any attribute that isn't white on black to high-intensity white on black. This operation can be done because interrupt 1C is called each time the clock ticks. At power-up this interrupt is initialized to do nothing, but after this program is installed, the interrupt saves all registers and segments used, turns off the screen, scans 80 characters and changes accordingly, turns the screen back on, and then restores all registers and segments saved.

Joe Mocker
Goleta, California

There are indeed times when you cannot read color on a noncolor screen. Short of going into someone else's code and changing all the attributes, this method is the best solution to the problem. Note: If you want a normal white foreground rather than high-intensity white, change the 15 to 7 and the 1138 to 1130 in the DATA statement in line 50030.

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MARK ZACHMANN

PC Tutor

How Compatible?

Q: After having my Corona PC for about a year, I've run into the problem of IBM incompatibility for the first time. The problem: the IBM PC has an open socket

for an additional ROM or EPROM chip, while the Corona PC has only one EPROM socket, which already holds a chip with the BIOS.

A few programs now on the market—including a genetics package I'd like to use—use IBM's extra socket for a specialized chip. Is there any way to use these programs on the Corona PC?

Another difference between the IBM and Corona is the way graphics are handled. For the IBM PC, you must buy a graphics card, which provides memory at dedicated addresses from B800 to BC00. In the Corona, however, graphics are handled within the standard RAM. Is there a way to modify programs that depend on the IBM Color/Graphics Adaptor so they will work on my Corona PC?

Richard Bergman
King of Prussia, Pennsylvania

A: *The ROM or EPROM in the PC's extra socket is normally located at segment address F400. If your Corona PC doesn't use memory at that address for something else, you should be able to assign it to a ROM chip connected elsewhere.*

To check whether memory is already in use at segment F400, use DEBUG as shown below to display the contents of that area. (The Corona's version of DEBUG may use DOS-style prompts (>) instead of the doshes (-) that appear on the IBM.)

```
A) DEBUG

-DF400:0
```

If you don't have any memory in use at that segment, the first DEBUG display command (DF400) should display the same value at each location in that memory area. When I ran this command, for example, many E8s appeared; on one Corona PC, FFs appeared. As long as there's consistent repetition, the value itself is arbitrary.

The next two DEBUG statements test if any RAM is present at that address.

```
-FF400:0 1400 1 2 3 4 5

-DF400:0
```

The first statement fills the first few addresses with the values 1, 2, 3, 4, and 5. The last statement reads those addresses again; if the digits you entered reappear, then RAM was available to store those numbers.

If the F400 address space is unoccupied, you still have to install a board with a ROM chip that can be called at that address. Do any readers know if such a board is available for the Corona PC?

When it comes to IBM graphics compatibility, you're probably out of luck. There are other differences besides the Corona's graphics' being movable within RAM, while the IBM's are fixed in a dedicated memory area. For example, the two computers have different resolutions and different pixel layouts for graphics.

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PC TUTOR

The IBM PC's standard graphics modes provide 640 × 200 or 320 × 200 resolution. And the Corona provides 640 × 325 resolution. Even if a program is compatible with both computers, the Corona would be able to display its graphics in only the top two-thirds of its screen. By the way, the newer Corona Personal Best computers provide 640 × 400 resolution, a proportion that matches up neatly with graphics geared to IBM standards.

The most serious problem is that the IBM PC considers the highest bit in each graphics byte to indicate the leftmost pixel on the screen, while the Corona puts the lowest bit in the byte on the left. You should never assume that a graphics software package can overcome this problem unless its maker explicitly promises compatibility with the Corona PC.

Amber Forever

Q: Our office recently purchased an IBM Portable PC, but some have resisted using it because of the monitor's amber color. Is there any evidence that more eye fatigue is caused by amber screens than by green screens? Or are all differences in comfort due to individual preferences for one color over the other?

B.R. Dabbs
Sullivan, Illinois

A: *A preference for an amber or green screen is purely a matter of personal taste. In theory, the eye is more sensitive to green than red, so the green screen provides more effective contrast between foreground and background. In practice, however, many users like the amber screen because it has a moderate tone and doesn't wash out as much when under bright ambient lighting.*

Users who are accustomed to a green screen may balk at the unfamiliar amber color, but after a few days of using the new monitor, I suspect that most will get used to it. And many might eventually prefer amber screens.

I like the amber screens. In fact, I wish IBM sold an amber monochrome monitor for the desktop PC.

A Detour for Interrupts

Q: I would like to find specifications giving the contents of COMMAND.COM, ANSI.SYS, and GRAPHICS.COM. This might help me to figure out how to temporarily redirect DOS calls to my own routines and then afterward reactivate the standard operating system calls. So far, I've become very confused trying to use DEBUG to identify the DOS vector table.

Rodney E. Willard
Loma Linda, California

A: *The DOS 2.0 manual provided a good discussion of the system files; as of DOS 2.1, this information was moved into the* DOS Technical Reference *volume. A table identifying the interrupt vectors is included in the computer's* Technical Reference, *just before the section with BIOS source code listings.*

Redirecting DOS calls to other routines is a fairly simple process. All DOS calls go through INT 33, while BIOS calls go through various other interrupts (primarily INT 16 through INT 32). The hexadecimal address of an interrupt can be calculated by multiplying the interrupt number by 4. For example, the address of the Video interrupt (INT 10) is 0000:0040h.

When you want to tempararily insert your own routine at an interrupt, follow these steps: (1) Read the current 4-byte pointer at 0000:xxxx, an address calculated as explained above; (2) Place your routine's pointer (in segment:offset form) at that address, giving the offset value first; (3) Return the original pointer (found in step 1) to this address when your routine has finished processing.

Patching in Color

Q: I'd like to find an assembly language subroutine that I can insert or patch into existing applications programs so they would appear on my RGB monitor in color instead of black and white. I spend a lot

of time viewing the screen, and I'm tired of looking at that one color combination.

I've tried executing COLOR commands in BASIC before returning to DOS to invoke an applications program. The colors I set in BASIC remain on the screen while I work in DOS, but when the applications program starts running, the screen goes back to black and white.

Myron Mills
Jacksonville, Florida

A: *For consistent operations and to clear the screen before anything appears, most application programs reinitialize the screen by using the IBM PC's BIOS. This startup procedure might be the only part of the program that alters the computer's color palette.*

If the screen clears when you start the program and all subsequent characters appear in black and white, it's probable that the program rarely deals with the color settings. However, if characters with different colors ever appear during the program, the program is possibly doing too much internally with color for you to make simple changes.

For example, assume that your applications program is called PLAN.EXE and that it affects the color palette at only one spot. The following discussion should explain how to find that part of the program and to make the alterations you want.

First, make a copy of the program, rename the copy, and then load the renamed program into DEBUG:

```
A) COPY B:PLAN.EXE  A:
A) REN PLAN.EXE  PLANN
A) DEBUG PLANN
```

Next, use a DEBUG command to search for the INT 10 Video calls, which contain the code CD 10:

```
-SCS:0 LF000 CD 10
```

Suppose, for argument's sake, that this command lists three addresses, which are candidates for alteration:

```
0D95:2010
0D95:205A
0D95:2093
```

Examine each of these areas by using DEBUG's Unassemble (U) commands such as this one, which looks at the memory in the neighborhood of the first of those three addresses:

```
-U 2008
```

You don't have to enter the first four digits of the address here, since the CS value is a default used by the U command. In the output that appears on the screen, you might see some unassembled instruction like this:

```
MOV AX,5
INT 10
```

or perhaps this:

```
MOV AL,[...]
XOR AH,AH
INT 10
```

In any case where AH=0, the program executes an initialization instruction that returns the screen to its defaults. Wherever you find this sort of code, replace the INT 10 call with two NOP instructions; to do this, use the DEBUG Assemble (A) command and type in NOP twice.

After making these changes, use the W command to write the revised file back to disk, then type Q to quit DEBUG and return to DOS.

Rename PLANN to its original name, PLAN.EXE, and try to run the program. The first few times you try changing a program, don't be surprised if the system crashes. Keep experimenting, and you'll probably find that making such changes gets easier over time.

The PC Tutor solves practical problems and explains points of general interest. If you'd like to see your questions answered here, drop a line to PC Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016. ■

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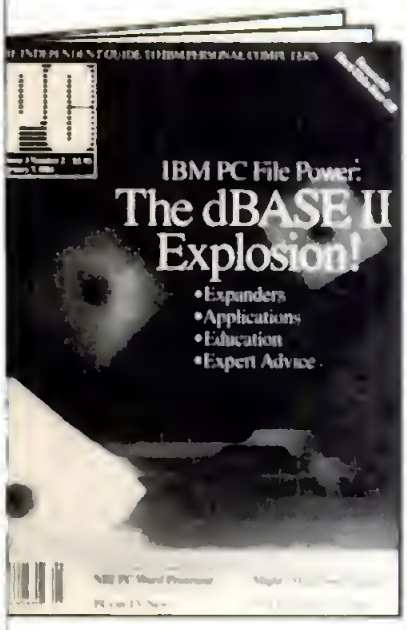

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A Communications Software Primer

When it comes to choosing a communications program, you have to consider hosts, smart and dumb terminals, error-checking protocols, and communications cruise control.

Choosing communications software can be as simple as using the program that comes with your modem or getting a copy of *PC-TALK-III* from a friend. On the other hand, it can be one of the most bewildering software choices you'll ever make.

The First of Many Distinctions

The first step in understanding communications software is to consider the distinction between host computer and terminal—a distinction that goes back to pre-PC times. The host computer, which can be anything from a micro to a mainframe, is connected to the terminal. When you call CompuServe, for instance, the CompuServe computer is the host and your PC becomes the terminal.

The distinction between host and terminal can get fuzzy when you're dealing with PCs. If your system is set up so I can call you, and each of us can type things at the keyboard that the other can read, then we are dealing with two terminals. But if your system is set up for unattended, auto-answer, remote operation, it is acting as a host. I can call, run programs, and give your system orders to send me files. The only difference between the two situations is the software you're running. The program that lets your PC act as a terminal is best described as a terminal program.

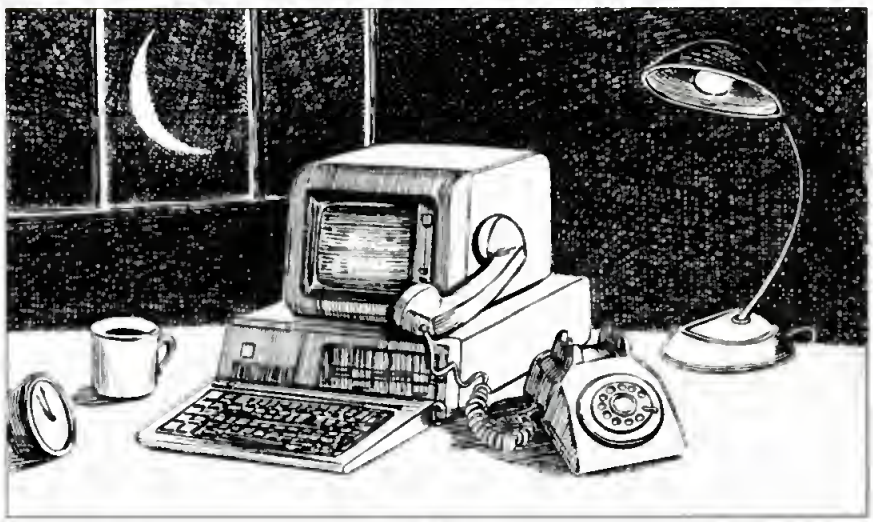

Illustration: Kimberly Root

Drawing the Line

Terminals and terminal programs come in two basic varieties: dumb and smart. Strictly speaking, a dumb-terminal program lets you do nothing more than type at your keyboard and read from your screen. As soon as you add even one feature—automatic dialing, automatic log-on, or the ability to turn a printer on and off—you have a smart-terminal program. A more useful place to draw the line between dumb- and smart-terminal programs, however, is with the smart terminal's ability to capture incoming information and save it to disk.

Smart-terminal programs divide quite nicely into two categories: those that are designed for direct interactive communications, meaning that you have to be at the keyboard operating the computer, and those that are able to operate unattended.

Most smart-terminal programs include a file-transfer capability. Without this capability, a smart terminal forces you to transfer files in a clumsy, two-step procedure. To send a file, you load it into the PC's memory and then use a second command to transmit it. To receive a file, you capture the incoming information in memory and then save it to disk. The file-transfer function lets you use a single command to transfer files directly to or from the disk.

(continued)

Virtually all programs that have a file-transfer capability will let you transfer both ASCII files (text files) and binary files (usually program files). Normally you designate the kind of file transfer you want at the time of the transfer. Be aware, however, that transferring a binary file can be like playing Russian roulette. Telephone lines are noisy, and noise translates into errors. An occasional error in a text file is no big deal—it can be spotted easily and corrected. However, an error in a program file is difficult to find, and it can render the program useless.

Error Hounds

The solution is to use an error-checking protocol. Several protocols are available, and each works differently, but the basic idea is the same: The receiving computer sends information back to the transmitting computer for comparison and confirmation. If the information isn't what it's supposed to be, the transmitting computer tries sending that part of the file again.

Most error-checking protocols are proprietary and can be found bundled with programs sold by a single company. These protocols are useful for transferring files between two or more of your own computers. If you want to exchange files with other people, however, you're probably better off getting a program that uses a more commonly used protocol.

For this purpose, the only reasonable choice at the moment is the XMODEM protocol (also known as the MODEM7 protocol). (See "XMODEM: A Standard Is Born," *PC*, Volume 3 Number 7.) XMODEM is not 100 percent reliable, but because it is in the public domain, you'll find it on a large number of programs. You might also want to look for a program that gives you the choice of two or more protocols. Error-checking protocols should not be confused with other kinds of communications protocols, such as the X/On-X/Off protocol. X/On-X/Off is an important capability in file transfer, but it has nothing to do with error checking.

When you're receiving a file that is larger than your PC's memory capacity, it's important to have a way to tell the other computer to stop and wait while your PC frees up its memory by writing the information to disk. The X/On-X/Off protocol lets you do that. When the receiving PC runs out of memory, it sends the X/Off signal, which the transmitting computer reads as, "Hold on—I'm busy." When the computer is ready for more, it sends the X/On signal, which says "Okay, go ahead." For capturing incoming data to disk, you want a program that has an error-checking protocol *and* the X/On-X/Off protocol.

If you want to exchange files with other people, get a program that uses a commonly used protocol.

Many terminal programs have other features as well, including automatic dialing and redialing, automatic log on, and the ability to define function keys so you can send long commands to the host system with a single keystroke. For programs designed for direct interactive communications, such capabilities are sophisticated conveniences. For programs designed for unattended operation, however, they're necessary.

Communications Cruise Control

Unattended operation can be divided into two basic categories: incoming and outgoing.

Outgoing unattended operation lets you fully automate your communications session, so you could, for instance, leave your office at 5 p.m. but set your PC to wake up after 6, when rates are lower. It could then dial the phone, log on to a system, ask for information, save that information to disk, log off the system, and hang up.

Incoming unattended operation is often referred to as remote operation—the PC becomes a host computer that will answer the phone and obey orders from the caller. A more prosaic kind of remote operation would let you leave your New York office at 5 p.m. Eastern Time and leave your PC running so that your Los Angeles office could call at 4:30 Pacific Time and send a daily report. You would find the report waiting for you at your office the next morning.

For the Beginner

If you are new to communications and you don't need fancy features like unattended operation, the first program you should get is *PC-TALK-III*. It isn't the best program available, but it is one of the better ones for nonautomated communications. More to the point, it serves as a standard against which you can measure other programs, and the price can't be beat.

PC-TALK-III is distributed as "user-supported" software, which means you can probably get a copy from a friend or a user group. Payment is strictly on the honor system: $35 if you like it, nothing if you don't. You can also get a copy directly from Headlands Press by sending $35 or by sending a formatted double-sided disk or two formatted single-sided disks along with a pre-addressed, prepaid return mailer. The address is Headlands Press, Inc., P.O. Box 862, Tiburon, CA 94620.

Considering that you can try *PC-TALK-III* for free, there's no reason to settle for anything less (or rather, anything more!). At the very least, you can use *PC-TALK-III* as a baseline program, treating it as a bargain-basement minimum. There's a good chance you won't need anything more for your communications needs, and if you do, you'll have some experience upon which to base your decision. ■

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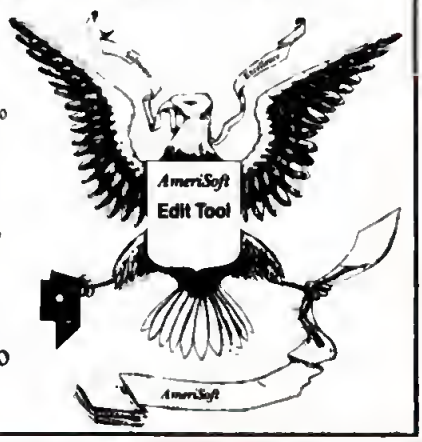

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Significant Figures

In October, we carried the first of a series of three articles on floating-point routines, which are used to represent fractions or to work with numbers larger than 65,535—the largest number representable in 16 bits. Multiplication and division are the subject of the second part of this series.

Modula-2, Part 1

An introduction to the programming language that combines the strong type checking, readability, and run-time error checking of Pascal with the flexibility and low-level access of C. The second part of our Modula-2 coverage will run in December—a comparative review of three compilers.

Communications

Another in our continuing review of communications products for the PC.

Program Overlays

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Coming Up

Printer Roundup

Everything you always wanted to know about printers—and more—will be covered in a special expanded issue. Eighteen top *PC* authors will review, measure, and examine 119 printers, including fully formed character printers, dot matrix printers, ink jet printers, color printers, and new laser and thermal printers. In addition, we'll take a look at typewriters that can work as computer printers and printers that can work as typewriters. Each printer will be reviewed individually, and the editors will choose their favorites in each category. All will be tested for speed, print quality, noise level, PC-compatibility, and graphics capabilities. Enlarged print samples will let you examine each printer's quality. Tables for each category of printer will allow you to make the best-informed printer comparisons ever!

If you want to know how to get more out of your printer, how to buy one, how to use one, or how printers work, you'll find an article here. Our User-to-User and PC Tutor columns will be filled with handy printer tips. Professional columns will examine how color printers can be used in business writing to produce dazzling charts and graphs. Attorneys will learn how their practices can benefit from high-quality and draft printers. Science writers will find out how printers can fulfill their special requirements. Best of all, we've uncovered some real printer sleepers—printers you may never have heard of, but which do their jobs surprisingly well and at a favorable price/performance ratio.

PC-Compatibles

PC, Volume 3 Number 24, will offer a look at the latest crop of PC-compatibles. Stephen Kanzler and Leslie Brown will dissect the latest offering from Ericcson. Alfred Poor and Robin Webster look at the Hewlett-Packard. Bill Machrone reviews the Compaq Deskpro. The NCR and Stearns will be reviewed by David Obregón, while Craig Stark examines the ITT and Paul Somerson checks out the AT&T. In addition to reviewing each machine on its own merit, we will test all of them for their ability to run standard IBM PC software, including *dBASE II*, *1-2-3*, *WordStar*, and *Flight Simulator*, and we'll compare their speeds against that of the PC.

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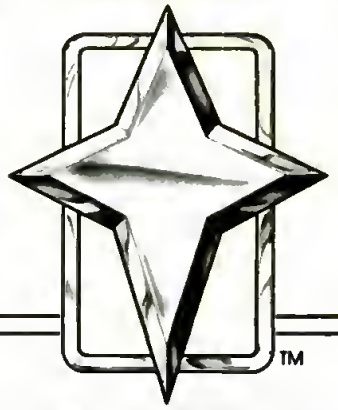

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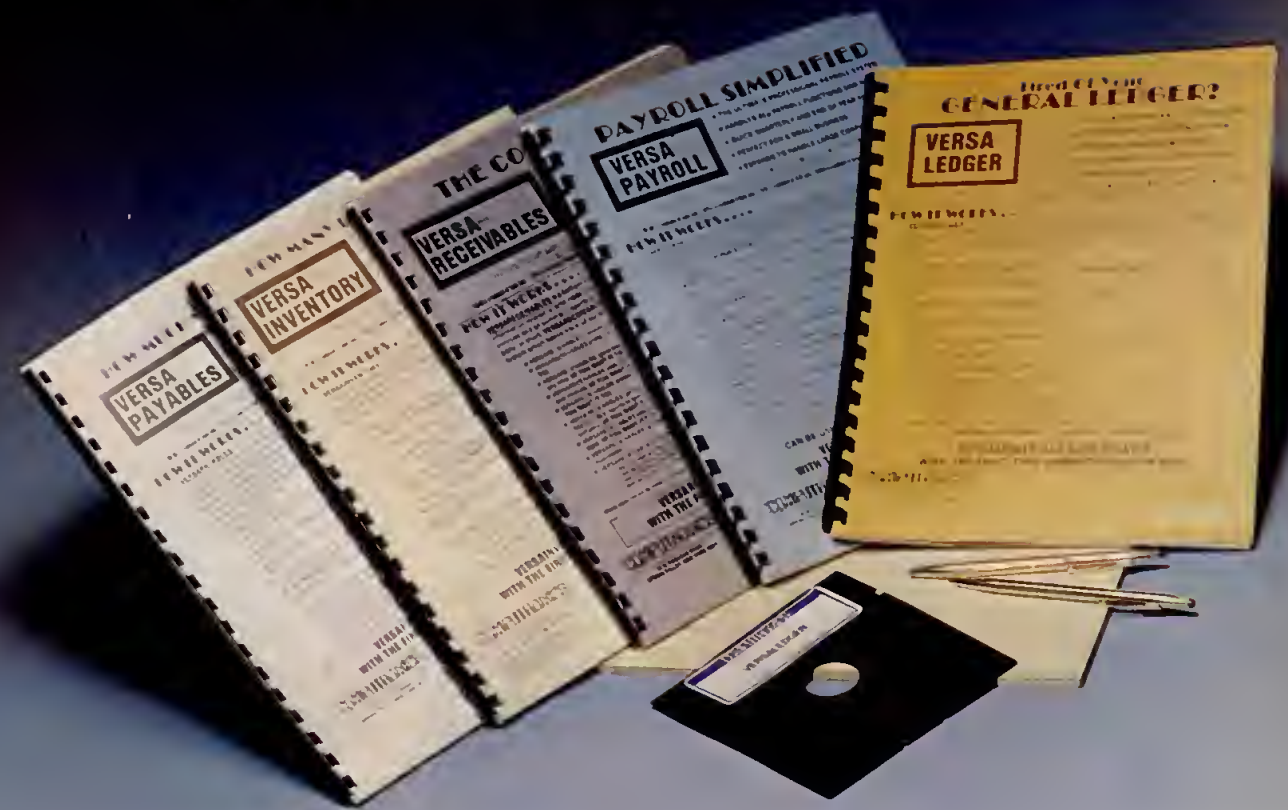

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